Final Report
April 2023

Second Evaluation of High Speed 1

Department for Transport
Our ref: 24202501
Client ref: TROO0324

steer

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Second Evaluation of High Speed 1

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Executive Summary

Background

Steer was appointed by the Department for Transport (DfT) to undertake a "Second Evaluation of High Speed 1". Steer was supported in the study by Cambridge Econometrics. This exercise followed an earlier evaluation study (the "first evaluation") commissioned by DfT in 2013.

The purpose of this second evaluation was to examine the longer-term impacts of the Channel Tunnel Rail Link, which is better known as High Speed 1 (HS1) and thereby strengthen DfT's overall evidence base for major projects and support planning for other schemes. The objective was to update the first evaluation in respect of transport impacts as well as wider economic and social impacts. The focus is on the impacts in Kent rather than the regeneration impacts around St. Pancras and Stratford International railway stations in London. It was also not intended to consider the still-evolving and significant impacts of COVID-19 on the railway, so the evaluation focused on the impacts of HS1 from its opening up until March 2020 only.

Development of HS1

In 1994, international passenger services linking London Waterloo to Paris and Brussels via the conventional rail network and the Channel Tunnel were launched. HS1 is a high-speed railway and links London St. Pancras International station with the Channel Tunnel and Kent. The first phase of HS1 opened in September 2003 and the second phase in November 2007, when international services transferred from Waterloo to St. Pancras International. By 2019, there were between 27 and 30 daily international services between London and Paris, Brussels or Amsterdam.

In 2009, as part of the South Eastern franchise, domestic high-speed services between London St. Pancras and Kent were introduced

Theory of change

As a basis for this evaluation, we developed a logic map outlining the relationships between the transport outputs resulting from HS1 and its social and economic impacts, including population and employment change, housing and commercial development, commuting behaviour, business growth and Gross Value Added, foreign direct investment, tourism visits and spend, and local land values.

Similarly, we developed a logic map outlining the relationships between the outputs and the outcomes in terms of both the impacts on passengers and the impacts on non-users. The key questions explored include the level of (generalised) journey time benefits for passengers, the impact of the fare differentials charged on high-speed services, the impact on demand and whether changes to crowding or train service performance have affected this or the journey time benefits. For international services, we also looked at whether there had been a change in modal share (towards rail instead of air travel) and any resulting impact on CO_2 emissions.

Socio-economic impacts

The socio-economic impacts of the domestic rail services enabled by HS1 were assessed using three complementary approaches:

- Analysis of trends in the socio-economic indicators in the localities served by HS1-enabled high-speed services
- Econometric analysis of the socio-economic impacts

- Qualitative interviews with local stakeholders.

These three strands of analysis provided different perspectives on the socio-economic impacts of HS1-enabled high-speed domestic services, but these were broadly complementary. All three strands indicated that there have been a diverse set of impacts across the region affected by HS1-enabled high-speed domestic services.

The area most clearly benefiting from HS1 has been Ashford, with significant population and housing growth, as well as new businesses being attracted to the town. Other areas (such as Canterbury) have also seen population growth and HS1 has helped to facilitate the arrival of new businesses. Inbound tourism has also been identified as a benefit in areas with suitable attractions, including in areas further from London where the time-saving benefit of HS1 is greatest, confirmed by increases in journeys originating in London to locations such as Thanet and Folkestone.

Trend analysis indicated significant population growth compared to comparators in the rest of Kent and the South East in only a few areas (particularly Ashford), but the econometric analysis indicates that high-speed services led to higher population growth in most areas served by HS1 than would have been the case without it.

Analysis of rail data showed an increase in commuting towards London where there has been strong population growth. This is consistent with the limited employment and GVA growth in these areas indicated in both the trend and econometric analysis, implying that such commuters are earning their salaries elsewhere – in particular in London.

Consistent with this, we identified greater wage differentials between London and Kent compared with those between London and other sub-regional clusters outside London. In Kent we find a differential between local and inner London wages of 45%, compared to just 8% in Bracknell Forest of example. This means the financial incentive to work in London is much higher for Kent residents than Bracknell Forest residents.

In some areas, such as Thanet and Folkestone, there have been significant increases in journeys originating in London towards HS1-served areas in Kent, consistent with increased tourism noted by stakeholders interviewed in the qualitative analysis. Stakeholders also noted an increased attraction for businesses in areas served by HS1.

While it is possible that increased levels of population and attraction for businesses in Kent will lead to greater economic activity (employment and GVA) over time, this has not yet been seen in the macro trends in historical data.

Overall, the impact of HS1 on rail demand indicates a benefit where there has been more co-ordination with housing supply and other local services, as in Ashford, compared with areas where, for diverse reasons, supply has been constrained, such as in Ebbsfleet. There are positive perceptions of HS1 in both local government and the business community, but the current socio-economic data only appears to reflect these perceptions in a few locations.

Transport impacts

The services enabled by HS1 have led to transport impacts, felt by passengers of high-speed and domestic rail, and international air passengers. Benefits and operating costs were assessed for both international and domestic high-speed services, considering what would have happened in the absence of HS1.

International high-speed services benefits

International rail journeys between London and Paris/Brussels (and other continental destinations served by Eurostar) were improved by around 30 minutes through the use of HS1 infrastructure, rather than the slower route on conventional lines used before 2003. This led to increased patronage on international rail services over and above the increase that would have been expected. This was due to international rail services capturing a larger share of the overall market. It is also expected that faster international rail services would induce some market growth over and above what would have occurred in any event. In the combined Paris and Brussels markets, rail's modal share (against air travel) rose from 59% in 2003 to 81% in 2010, corresponding to the period during which rail journey times were improved by HS1 infrastructure.

The aggregate journey time reduction due to the improved rail service was 274 million minutes in 2019. The revenue associated with the increased international rail patronage is also an economic benefit of the HS1 scheme. However, it is not possible to identify separately the share of this which is associated with rail capturing a larger share of a growing market in the absence of HS1 and what share is associated with induced demand. Nonetheless, it is expected that the former accounts for the bulk of the revenue uplift. The estimated international revenue improvement in 2019 due to HS1 was £238 million.

The increase in rail's modal share in the London-Paris and London-Brussels markets means that air traffic has fallen below what it would otherwise have been, reducing the number of aircraft seats flown, and so reducing emissions from air traffic. We estimated an annual saving in CO_2 emissions from 2010, which reached 145,000 tonnes by 2019.

Domestic high-speed services benefits

On domestic routes, the 2019 timetable led to an additional 16.7 million passenger journeys on high-speed and other services, partially offset by a reduction of 9.1 million journeys on the South Eastern franchise classic rail network leading to a net increase of 7.7 million journeys, or around 4.2% of total journeys taken on the South Eastern franchise in 2019. There were also an additional one million journeys on other parts of the national network attributable to HS1. These journey increases resulted in revenue increases of £84 million.

Train performance improved due to the use of more reliable HS1 infrastructure, but this impact was small, reducing delays by an average of only 18 seconds per journey.

Aggregate journey time savings in 2019 were 514 million minutes. Of these savings, 418 million minutes were attributable to the high-speed services themselves, or to improvements to services on the South Eastern franchise classic network. We also estimate a further 88 million minutes savings in aggregate "crowded minutes" on the national network, of which 47 million minutes related to the South Eastern franchise.

Operating costs

Operating costs modelled covered both domestic and international services (for the part of their journeys in the UK only). Operating costs for 2019 were £385 million higher than would have been the case for operating the equivalent services without HS1 infrastructure. This is primarily due to the track access charges for HS1 being much higher than for the classic network, noting that the HS1 charges include an element of financing costs for the construction of the high-speed line. This results in a cost increase of £278 million – i.e. over 70% of the total cost increase.

Monetised evaluation of benefits and costs

The transport impacts set out above have been used to undertake an ex post cost-benefit analysis (CBA) of HS1. This CBA has been undertaken following the approaches set out in DfT's Transport Analysis Guidance (TAG), which considers the direct impacts of changes to the transport network, while excluding the longer-term effects of any changes to the scale and distribution of population and economic activity. As is usual practice, the CBA considers a 60-year period from scheme opening, which for the purposes of the CBA has been taken to be the beginning of 2010/11 financial year.

Excluding wider economic impacts (which are primarily static agglomeration), the CBA shows that the monetised costs of HS1 exceed the monetised benefits. The 'initial' benefit-cost ratio (BCR) is 0.64. If this were an ex ante appraisal, that would suggest that the starting point for a value for money assessment is that HS1 provides poor value for money, although other factors would come into consideration before coming to a final view. This finding of the CBA is consistent with the findings of a comparable assessment made as part of the first evaluation.

The inclusion of wider economic impacts, specifically Level 2 impacts including static agglomeration, output change in imperfectly competitive markets and labour supply impacts, leads to an 'adjusted' BCR of 0.70. While an increase on the initial BCR, if considered alone this BCR would also suggest poor value for money. That is, while wider economic impacts increase the monetised benefits, they are not sufficient to change the value for money category. Dynamic impacts, i.e. changes in scale and distribution of population and economic activity have not been included in this assessment, though in an ex ante appraisal these would be assessed as part of a wider Value for Money assessment. Benefits that could not be reliably attributed to HS1, including from regeneration around London stations, were excluded from the scope, no assessment has been made of their potential impact on the value for money category.

Conclusion

The construction of HS1 provided greater capacity for international passenger services between London and the Channel Tunnel, with journey time saving of around half an hour. However, international passenger numbers using HS1 are lower than forecast at the time the construction of the Channel Tunnel Rail Link was approved. There remains substantial unused capacity on HS1 and so potential for a future expansion of the international service offer to lead to further economic benefits.

The operation of high-speed international services between London and Paris, Brussels and other continental destinations, as well as the operation of high-speed domestic services between locations in Kent and London, has led to significant benefits for travellers in terms of journey time savings and reduced crowding. It has also led to an increased number of international journeys in both absolute and modal share terms and to an increased number of domestic journeys between Kent and London, with a corresponding increase in revenues for the domestic franchise operator.

In socio-economic terms, there have been clear benefits to certain locations served by the new domestic high-speed services, in particular in Ashford and, to a lesser extent, in Canterbury and other locations in East Kent. Businesses have been attracted to Kent by the faster services and inbound tourism has benefited, with more journeys to tourist locations originating from the London end of the route. However, in some locations, supply constraints have prevented increases in demand from leading to a growth in population. Where

population growth has taken place, it is largely associated with increased commuting to London, with the result that local economic indicators, such as GVA per capita, have not increased significantly compared with peer locations which have not benefitted from HS1.

The impacts on the parts of Kent that fall in the Thames Gateway (Dartford, Gravesham, Medway and Swale) have been more modest. In general, these areas have received the smallest reductions in journey times to London and the premium fare for domestic services reduces the gain further. There is still potential for HS1 to contribute to further redevelopment and regeneration in the Thames Gateway, although it is noted that other local and national policies as well as the wider health of the national economy will also influence the rate and scale of development.

1 Introduction

Background

1.1 Steer was appointed by the Department for Transport (DfT) to undertake a "Second Evaluation of High Speed 1". Steer was supported in the study by Cambridge Econometrics. This exercise followed an earlier evaluation study (the "first evaluation") commissioned by DfT in 2013.

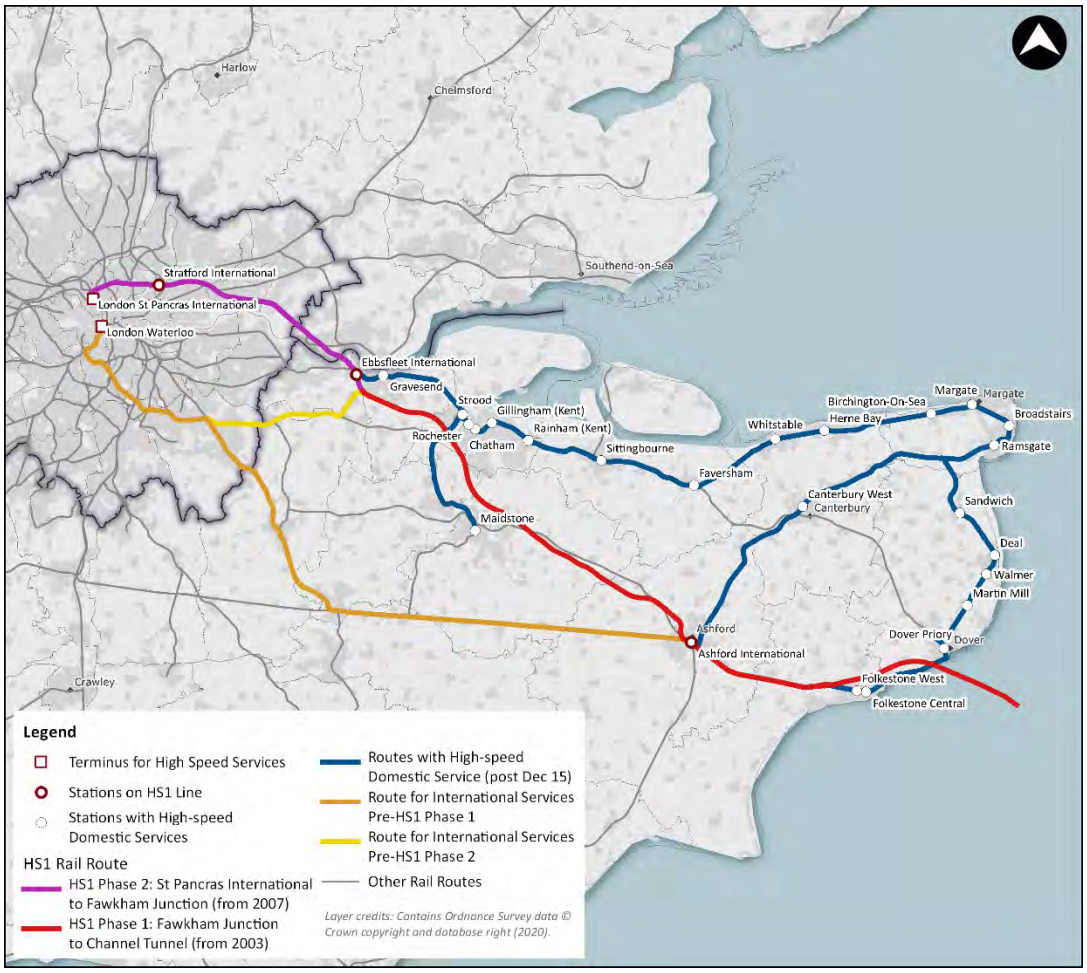
1.2 High Speed 1 (HS1) is the name given to the Channel Tunnel Rail Link. It is a high-speed railway line which links London St. Pancras International station with the Channel Tunnel and Kent. The line runs from St. Pancras to the Channel Tunnel, via stations at Stratford, Ebbsfleet and Ashford and carries international passenger services operated by Eurostar International Ltd. to and from mainland Europe.

1.3 HS1 is also used by domestic high-speed services that link St. Pancras with other HS1 stations, as well as stations on the "classic" (i.e. non-high-speed) network in Kent. In total, 29 stations on the South Eastern network are served by the domestic high-speed services and these include Canterbury West, Folkestone (West and Central stations), Dover Priory, Ramsgate, Margate, Whitstable, Faversham, Chatham, Rochester and Gravesend, as well as London St. Pancras International and Stratford International.

1.4 HS1 was opened in two stages, with the section from the Channel Tunnel to Southfleet Junction in Kent with a link to the classic lines via Fawkham Junction, opening in September 2003 and the remainder of the line to St. Pancras International opening in November 2007. International services used the first section from 2003 and the full line to St. Pancras International from 2007. Domestic high-speed services from Kent to St. Pancras International commenced in 2009.

1.5 The map below (Figure 1.1) illustrates the geography of HS1 and the associated domestic high-speed services (post December 2015), as well as the pre-HS1 routes used by international (Eurostar) services over the classic network to the former Waterloo International station.

Figure 1.1: HS1 infrastructure and associated high-speed services



Source: Steer

First interim evaluation

1.6 A first interim evaluation was commissioned by DfT in 2013 and published in 2015 in two volumes:[1]

- Atkins, Aecom and Frontier Economic (2015) First Interim Evaluation of the Impacts of High Speed 1 Final Report Volume 1 – Main Report
- Atkins, Aecom and Frontier Economic (2015) First Interim Evaluation of the Impacts of HS1 Final Report Volume 2 – Appendices.

1.7 With respect to high-speed domestic services key findings from the first interim evaluation were that:

- From stations served by high-speed domestic services:
  - there were significant reductions in journey times
  - significant capacity was added to the network
  - crowding appeared to have reduced
  - service reliability and punctuality were improved

[1] Both volumes are available at: **HS1: first interim evaluation**

  - passenger service ratings were higher than for existing services.
- It was also found that high-speed domestic services:
  - led to additional growth in rail patronage with a quarter of high-speed domestic demand new to rail
  - that this patronage was dominated by journeys in and out of London
  - led to Ashford becoming an important node on the transport network
  - were a factor in 18% of surveyed respondents' job or home relocations.

1.8 It was also found that while a goal for high-speed domestic services was to support provision of up to 10,000 new homes in the vicinity of Ebbsfleet International station, at the time of the interim evaluation only 300 new houses had been completed.

1.9 For international travel it was found that:

- Patronage had increased over time, although was lower than forecast
- Patronage increased once international services were using the HS1 infrastructure
- International HS1 patronage is predominantly to/from London St. Pancras International, and this accounted for 90% to 95% of the total
- Just over 70% of international journeys were to or from France, with the large majority of the remainder travelling to or from Belgium. Business trips accounted for between 20% and 25% of journeys.

Objectives and scope

1.10 The purpose of this second evaluation was to examine the longer-term impacts of HS1 and thereby strengthen DfT's overall evidence base for major projects and support planning for other schemes.

1.11 Noting that the first evaluation of HS1 was commissioned in 2013 and published in 2015, DfT's Statement of Requirements stated that this second evaluation of HS1 should update the evidence of the first "interim" evaluation in two areas:

- *Transport impacts*, including journey times, performance, patronage and customer satisfaction on the line itself, as well as impacts on the wider network, including additional capacity and the effects on other services in the region, local transport links to stations and the environmental impacts of any mode shift
- *Wider economic and social impacts* experienced around stations and communities served by the line, including associated development activity, trends in commercial and residential property values, population trends, employment trends and business performance.

1.12 It is also noted in the Statement of Requirements that the effects of the global financial crisis 2007-2009) are likely to have impaired the short-term take-up of high-speed domestic services following their introduction in 2009. One goal for this second evaluation is to examine how the effects of the services operating on the line changed following recovery from the recession.

1.13 In contrast to the first evaluation, this second evaluation does not include an assessment of the impact of HS1 on the value of UK government assets. It also does not include an assessment of the regeneration impacts around King's Cross and St. Pancras railway stations. With regard to the former, DfT's position is that such consideration was concluded satisfactorily through the first interim evaluation of HS1. The latter impacts are subject to a separate and parallel piece of work, taking into account the multiple transport interventions in the area around these major London stations.

1.14 It is not intended to consider the still-evolving and significant impacts of COVID-19 on the railway, so the evaluation focuses on the impacts of HS1 from its opening up until March 2020 only.

High Speed 1 outputs, outcomes and impacts

1.15 The construction of HS1 has led to outputs which include:

- a high-speed railway between London and the Channel Tunnel via Kent including new stations
- faster international services shortening journey times and additional capacity for international services
- new high-speed domestic services from a number of stations in Kent (as per paragraphs 1.2 and 1.3) which reduced journey times (but with a fares premium applied)
- capacity being returned to the classic network following the complete removal of the international services from the network which, along with the introduction of domestic high-speed services, led to a recasting of classic domestic services
- a net increase in train capacity between Kent and London
- facilitation of other timetable adjustments on rail services into London from the south leading to additional capacity and more reliable services including improvements to services into Waterloo facilitated by the repurposing of the former international platforms following the move of the international terminus to St. Pancras
- additional capacity for freight.

1.16 HS1 has led to a range of outcomes. Some key outcomes include:

- further growth in international rail travel, including from modal shift from air services to the two principal international destinations, Paris and Brussels
- stimulation of rail demand between Kent stations and London as a result of the faster high-speed and reconfigured classic network services, with potentially some modal shift away from car travel.

1.17 These and other outcomes led to the potential for a number of impacts, which include:

- population growth in areas with improved rail services, with the hypothesis that high-speed domestic rail services have attracted London commuters as well as leisure travellers into those areas
- business growth in areas with improved rail services.

1.18 These impacts, which are the subject of the study, have been explored through the analysis of a range of data sources, as well as econometric modelling.

Approach to evaluation

1.19 The purpose of any ex post evaluation such as the present study is to review using observable evidence on the impact of the intervention, which in this case is the construction of HS1 and associated changes to rail services. This immediately raises the question of the baseline against which the impact should be measured.

1.20 For the assessment of domestic socio-economic impacts, by considering trends from 2006 to 2019 and comparing these with trends observed in other parts of Kent and over the wider South East, we have considered the historical development of the areas most directly affected by the introduction of domestic HS1 services in 2009. We have also used a synthetic control method as part of econometric research to isolate the effects observed due to the

introduction of HS1 from other factors. It should be noted that benefits that could not be reliably attributed to HS1, including from regeneration around London stations, were excluded from the scope, no assessment has been made of their potential impact on the value for money category.

1.21 For the assessment of international and domestic transport impacts (such as journey time benefits for travellers), we were able to identify the effects specifically attributable to the new train services through the construction of a "counterfactual" timetable, meaning the situation which might have occurred had HS1 not been built. Comparison of the outputs which would have been achieved had the counterfactual timetable been operating compared with the actual situation in 2019, allows an estimate of the benefits to be calculated. The monetised value of these benefits can be estimated using parameters set out in DfT guidance.

1.22 On the cost side, the capital costs of building HS1, along with an estimate of the incremental costs of operating services using HS1 rather than with the counterfactual timetable allow a monetised evaluation of HS1's costs to be made.

1.23 Comparing monetised benefits and monetised costs allows a benefit-cost ratio (BCR) to be calculated. This BCR has been calculated using methods consistent with those used by DfT for the ex ante appraisal of new transport investment. Dynamic impacts, such as the effects of any changes to the scale and distribution of population and economic activity are not explicitly taken into account, noting that an anticipated impact of HS1 is population and business growth in areas served by high-speed services. It should also be noted that current DfT appraisal guidance is more sophisticated than the guidance which applied at the time of the original ex ante appraisal, so the results of this ex post evaluation will not be exactly comparable with the ex ante appraisal.

Development of HS1

1.24 We firstly review the development of HS1 in terms of the stations served and the journey time benefits as well as, for domestic services, the impact of fares due to the fares premium for domestic high-speed services when compared with travel on the conventional network.

Theory of change

1.25 We go on to set out this evaluation's theory of change. A theory of change is a statement of how it is believed that the transport outputs provided by HS1 (journey time reductions, frequency enhancements etc. as per paragraph 1.15) lead to outcomes (increased patronage, more reliable services, etc.) which in turn lead to long term impacts on society and the economy. The theory of change helps shape subsequent analysis, in effect providing a set of hypotheses to be explored through the different channels of quantitative and qualitative analysis.

Social and economic impacts

1.26 A range of social and economic impacts have been considered. The approach has been to develop:

- a descriptive analysis to identify apparent impacts of domestic high-speed services on patterns of population and employment, as well as the nature of those changes, looking at historical trends (Chapter 4)

- an econometric analysis to quantify changes to key metrics since HS1 opened using a synthetic control approach to identify where these changes can be validly attributed to HS1 rather than other factors (Chapter 5)
- a qualitative analysis of stakeholder interviews, to explore the perceived impacts of HS1, and identify enablers and barriers (Chapter 6).

1.27 The social and economic impacts have been associated with each of the different geographical areas in Kent affected by HS1, allowing a comparison of the benefits to the service improvements in that location.

1.28 The quantitative analysis has been complemented by qualitative research, in which we undertook semi-structured interviews with stakeholders including local authorities and relevant local businesses.

Transport impact assessment

1.29 For an ex-post evaluation such as this, a principal challenge is to identify the situation which would have occurred if HS1 had not been built (the "Counterfactual Scenario"). There are a number of issues that have had to be considered in developing this counterfactual case, and these are discussed in more detail in Chapter 7. These include the historical rail timetable in 2003 (pre-HS1), and also other changes to infrastructure, services and passenger demand which have taken place since then, some but not all of which might still have occurred in the absence of HS1.

1.30 The first interim evaluation adopted a domestic rail service counterfactual that was simply the pre-2009 domestic timetable. While a reasonable assumption at that time, such an approach is no longer considered appropriate. As has been witnessed across the London-focussed commuter rail network, there has been continued investment in the network and in rolling stock to increase capacity and improve performance and this has led to changed services. It is no longer reasonable to assume that in the absence of HS1 domestic rail services would be as they were in 2009 pre-HS1.

1.31 For the evaluation, we have identified impacts of the improved services facilitated by HS1, compared with the Counterfactual Scenario, in each relevant geography.

1.32 Transport impacts have been assessed by comparing the Outturn and Counterfactual Scenarios. The approach has followed DfT Transport Analysis Guidance (TAG) methodologies and has considered factors such as journey times, the impact of fares, demand growth, train service performance, crowding and wider transport connections. These impacts have been associated with each relevant geography affected by HS1, allowing a comparison of the benefits to the service improvements between the Counterfactual and Outturn Scenarios.

1.33 The transport impact assessment is set out in Chapter 7.

Monetised evaluation of benefits and costs

1.34 The transport impacts identified are then monetised using DfT TAG methodologies to value journey time savings, incremental passengers, modal shift benefits (to air and away from road) as well as accounting for the capital costs and incremental operating costs. These allow monetised benefits over a standard 60-year period to be assessed as well as the corresponding (UK public sector) costs. These in turn allow a benefit-cost ratio to be derived, which can be compared with the estimate in the first evaluation. This is set out in Chapter 8. As previously

noted, while consistent with the approaches used for ex ante appraisal, the monetised cost benefit analysis does not fully capture all the anticipated impacts of HS1.

Discussion and conclusions

1.35 A discussion of the implications of each of the chapters and our overall conclusions are set out in Chapter 9.

Limitations

1.36 While not atypical for major rail investments approved in the late 1990s and early 2000s, HS1 was not subject to an on-going programme of monitoring and evaluation. This contrasts with current practice where the planning and budgeting of a comprehensive monitoring and post-opening data collection programme would form an integral part of an intervention's business case.

1.37 As a consequence, this evaluation has had to make best use of administrative data routinely collected by Government, as well as routinely collected rail industry data. This places a number of limits to the analysis, including there being no influence over the specification of the data, its geographic specificity or the availability of time series over the period from before HS1 opened to the present day.

1.38 As part of the first evaluation, a survey was undertaken which explored passengers' travel choices with and without HS1, as well as gathering data on their characteristics. Carrying out a survey did not form part of the method of this evaluation because:

- Noting that the evaluation was undertaken in 2022, the impact of the pandemic means that passenger preferences at that time will not necessarily be relevant to a study looking at impacts to the end of 2019, as well as their characteristics not necessarily being representative of passenger characteristics in the pre-pandemic period.
- The opening of HS1 has passed out of recent memory making it difficult for passengers to recall pre-HS1 behaviours.

1.39 As noted, this second evaluation does not consider the socio-economic impacts in the London area, with the focus (for domestic services) being on these impacts in Kent. This reflects the multiple interventions in the area around St. Pancras, which would have made attribution specifically to HS1 very difficult.

1.40 The analysis relies on the creation of a "counterfactual" case, in which a timetable has been constructed representing the situation which would have obtained on the railway, if HS1 had not been built. While significant effort and care went into the production of this, the counterfactual is necessarily imperfect given the lapse of time and other changes to the network, demographics and the economy in the meantime.

This document

1.41 This document represents the Final Report for the study. The remainder of the document includes the following chapters:

- Chapter 2: Development of HS1
- Chapter 3: Theory of change
- Chapter 4: Socio-economic impact trends
- Chapter 5: Econometric analysis
- Chapter 6: Qualitative analysis

- Chapter 7: Transport impacts
- Chapter 8: Monetised evaluation of benefits and costs
- Chapter 9: Discussion and conclusions.

2 Development of HS1

Historical development of High Speed 1

2.1 In 1994, international passenger services linking London to Paris and Brussels via the Channel Tunnel were launched. On the French side of the tunnel, a high-speed line to Paris, LGV Nord, had been completed. In 1997 a high-speed line opened from Lille to Brussels. These high-speed lines are capable of 300 kph speeds. Between London and the Tunnel, services initially operated over the conventional heavy ("classic") rail network.

2.2 HS1 is the name given to the Channel Tunnel Rail Link, the high-speed line between London and the Tunnel. The first phase of HS1 opened in September 2003 between the Tunnel and Southfleet Junction in Kent, with a connection to the classic lines via Fawkham Junction. Until the second section of HS1 to St. Pancras opened in November 2007, international services continued to use Waterloo as their London terminus station.

2.3 In 2009, as part of the Southeastern franchise, domestic high-speed services between London and Kent were introduced, enabling faster journeys for passengers. A further enhancement to the domestic high-speed service timetable was introduced in December 2015.

2.4 Since the opening of HS1, demand for international Eurostar services has increased, with Eurostar offering faster, more reliable services and adding extensions from Brussels to Amsterdam.[2] Enabled by HS1, Eurostar has procured a new fleet based on the European loading gauge (which could not operate over the classic network through Kent).

2.5 An overview of the development of international passenger services and domestic high-speed services is given in Figure 2.1.

[2] Source: Eurostar

Figure 2.1: Timeline of changes relating to Rail Infrastructure and Markets/Operations

<table>
<tr><th>Year</th><th>International Passenger Services (IPS)</th><th>Domestic high-speed services (DHSS)</th><th>Other Services</th></tr>
<tr><td>1994</td><td rowspan="3">November 1994 - IPS commence from London Waterloo to Paris & Brussels</td><td rowspan="10"></td><td rowspan="9">Southeastern and Southwestern services share classic network with IPS</td></tr>
<tr><td>1995</td></tr>
<tr><td>1996</td></tr>
<tr><td>1997</td><td rowspan="6">December 1997- High speed line from Lille to Brussels opens</td></tr>
<tr><td>1998</td></tr>
<tr><td>1999</td></tr>
<tr><td>2000</td></tr>
<tr><td>2001</td></tr>
<tr><td>2002</td></tr>
<tr><td>2003</td><td rowspan="4">September 2003 - HS1 opens between Channel Tunnel and Southfleet Jn / Fawkham Jn. Reduced journey time for IPS</td></tr>
<tr><td>2004</td></tr>
<tr><td>2005</td></tr>
<tr><td>2006</td></tr>
<tr><td>2007</td><td rowspan="11">November 2007 - second section of HS1 to/from Southfleet Jn. to St. Pancras opens and IPS transfer from Waterloo to St. Pancras. Further reduced journey time for IPS.</td><td rowspan="2"></td></tr>
<tr><td>2008</td><td>From 2008 - International platforms at Waterloo out of use</td></tr>
<tr><td>2009</td><td rowspan="5">December 2009 - DHSS launched</td><td>December 2009 - DHSS share classic network with other Southeastern services.</td></tr>
<tr><td>2010</td><td>Southeastern services recast.</td></tr>
<tr><td>2011</td><td rowspan="8"></td></tr>
<tr><td>2012</td></tr>
<tr><td>2013</td></tr>
<tr><td>2014</td></tr>
<tr><td>2015</td><td rowspan="4">December 2015 - DHSS timetable enhanced</td></tr>
<tr><td>2016</td></tr>
<tr><td>2017</td></tr>
<tr><td>2018</td><td rowspan="2">April 2018 - Eurostar extend some Brussels services to Amsterdam</td><td>December 2018 - Southwestern services start to use repurposed international platforms at Waterloo</td></tr>
<tr><td>2019</td><td>May 2019 - further changes to Southwestern services to make us of repurposed international platforms</td></tr>
</table>

Source: Steer

The government's objectives for HS1

2.6 As quoted by the National Audit Office (NAO),[3] the Department's stated objectives for HS1 were:

1. to more than double the capacity of four trains per hour (three in the evening peak) available for international passenger railway services between London and the Channel Tunnel
2. to reduce the journey time of those services between London and the Channel Tunnel by about half an hour to about 40 minutes
3. to provide greater capacity and reduced journey times for domestic passengers
4. to contribute to the regeneration of the Thames Gateway.

Current services enabled by High Speed 1

2.7 The current services form the basis of the Outturn case for the second evaluation of HS1. The December 2019 timetable has been used for the Outturn case.

International services

2.8 Prior to 2003, while there were four paths available for international services not all these were taken up. Eurostar operated between 25 and 30 services per day in each direction to or from London Waterloo. In 2019, Eurostar operated between 27 and 30 services per day, noting that Eurostar has complete commercial freedom to operate services on the train paths available to it and is not constrained by any train service specification imposed by the public sector.

Table 2.1: Difference in Weekday Eurostar service Quantum May 2019 vs May 2001 timetables

Destination	May 2001: Wednesdays	May 2001: Fridays	May 2019: Wednesdays	May 2019: Fridays	Difference: Wednesdays	Difference: Fridays
Paris	16	20	17	19	+1	-1
Brussels	9	10	9	10	-	-
Amsterdam *	0	0	4	4	+4	+4
Marne la Vallee (Eurodisney)	0	0	1	1	+1	+1
Total	25	30	27	30	+2	-

*Amsterdam services are extensions of services shown in the Brussels row, not additional paths from London.
Source: Eurostar, Steer analysis

2.9 HS1 has enabled Eurostar to offer shorter journey times to European cities from London, allowing its offer to be more competitive against other modes. Services operating on HS1 to and from London St. Pancras are around 30 minutes faster than pre-2003 services to and from Waterloo.

[3] Paragraph 3.9 NAO (2001) **The Channel Tunnel Rail Link: Report By The Comptroller And Auditor General HC 302**

High-speed domestic services

2.10 HS1 has enabled rail users in the South East to benefit from much shorter journey times to and from London with the launch of high-speed domestic services in 2009, with services consisting of:

- 2 trains per hour (tph) London to Faversham using HS1 between London St. Pancras and Ebbsfleet International
- 1 tph London to Dover Loop service
- 1 tph London to Margate via Canterbury West.

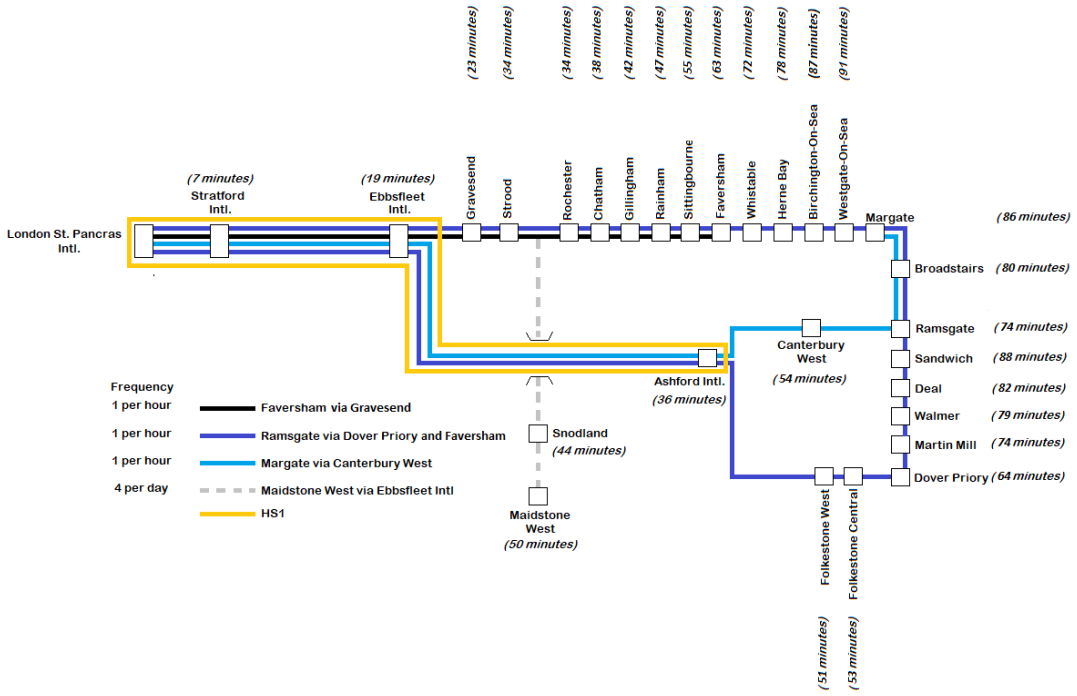
2.11 In December 2015 further changes were made to the service pattern:

- 1 tph London to Faversham
- 1 tph London to Ramsgate, Dover and returning to London via Ashford
- 1 tph London to Ashford and Folkstone, Dover, Ramsgate and returning to London via Faversham
- 1 tph London to Margate via Canterbury West.

2.12 In addition, a limited peak period only service was added linking St. Pancras with Maidstone West.

2.13 This is shown schematically in the diagram below, also showing journey times to London St. Pancras in minutes.

Figure 2.2: HS1 domestic service pattern post 2015



Source: Steer

Conventional services

2.14 Consequential effects of HS1 removing international services from the conventional rail network and domestic high-speed services operating on HS1 are:

- Southeastern franchise services on the Chatham, Maidstone East and Ashford lines have been recast to provide better connectivity for smaller stations
- South Western franchise services now use the former international platforms at Waterloo.

Non-HS1 changes to infrastructure and services since 2003

2.15 Since the opening of HS1, various railway infrastructure projects have been implemented as part of the Thameslink programme. The programme consisted of various upgrades that have led to enhanced direct train services between north and south London. Works include the remodelling of London Bridge station.

2.16 A further change is the remodelling of the former international platforms at London Waterloo for use by South Western Railway services and the timetable and formation changes that this has facilitated

2.17 There have been further changes to the rail connectivity of southeast England since HS1 was completed. The largest of these is the Elizabeth line, with the Crossrail Act for the programme receiving Royal Assent in July 2008 with funding approved in 2009 and the phased introduction of the full service pattern commencing in 2022.

2.18 The Elizabeth line was planned within the context of a programme of proposed rail enhancements in London and the South East including HS1. As a consequence, it is taken that the Elizabeth line has no impact on the Counterfactual and Outturn Scenarios. A similar position is adopted for other network and rolling stock programmes implemented across London and the South East over the period since HS1 was approved. What this means is that when defining the domestic Counterfactual, we have elected only to consider South Eastern and South Western franchise services.

Summary of changes due to high-speed domestic services

2.19 Shown in Table 2.2 below are changes to the level of service at stations served by domestic high-speed services. As well as journey times (JT) and frequency of services to London (in tph), the table also shows the "Generalised Journey Time" (GJT), which is a weighted combination of station-to-station travel time and waiting time (determined by train frequency). The pre-HS1 journey time figures are based on the December 2008 timetable and for GJT, we have extracted 2008 figures from DfT's Rail Usage and Demand Drivers Dataset (RUDD) data. The post-HS1 JT figures are based on the December 2015 timetable and for GJT, RUDD 2015 data.

2.20 When looking at the table it should be noted that:

- The RUDD data is for journeys to "London BR", so covers the relevant London terminus for the train service (Victoria, Charing Cross or St. Pancras), but does not cover the GJT element for connections on LUL, Bus, Walk etc. from Termini.
- RUDD combines Folkestone Central and Folkestone West into one category, "Folkestone BR", which is why the GJTs for two Folkestone stations are identical.
- GJT shown is for "Full" tickets only (slightly different values are shown for "Reduced" and "Seasons" ticket types). The journey times shown above are representative of the minimum time between the two stations (i.e. fastest train).

- The trains per hour (tph) values shown are for off-peak services and are based on all those services with a JT close to the minimum JT (up to +5 mins). Tph also excludes the longer journey legs of circular St. Pancras to St. Pancras services where the JT is significantly higher than the minimum JT.

2.21 The results show a reduction in both absolute JT and GJT for all stations served by HS1 since the commencement of high-speed services, implying an improved offer based on service provision alone. It should be noted that no allowance has been made for the change in London terminus to St. Pancras for the high-speed domestic services. This will have had positive and negative effects, depending on the passenger's final destination in London, but it is not practical to quantify the net impact.

2.22 The reduction in GJT arising from the introduction of domestic high-speed services using HS1 can be considered a good and objective measure of the "dosage" or level of treatment applied to each of the stations with high-speed service, when considering the socio-economic impacts observed ("dosage" being a commonly used concept when considering such impacts). The greater the improvement in GJT, the greater the "dosage" applied. Hence, if transport-related or socio-economic impacts are observed in these locations, it makes sense to consider the level of the impacts in comparison with the level of "dosage" or improvement in train service benefiting them.

Table 2.2: Summary of impact of HS1 on domestic services frequency and journey times

HS1 Station	Journey time to London BR pre-HS1 (mins)	Trains per hour pre-HS1	GJT to London BR pre-HS1 (mins)	Journey time to London BR post-HS1	Trains per hour post-HS1	GJT to London BR post-HS1 (mins)	Change in JT (mins)	Change in JT (%)	GJT change (mins)	GJT change (%)
Ashford International	63	2	90	36	2	61	27	-43%	29	-32%
Canterbury West	87	1	115	54	1	89	33	-38%	26	-23%
Ebbsfleet International	-	-	n/a	19	4	32				
Dover Priory	93	1	129	64	1	102	29	-31%	27	-21%
Folkestone Central	81	1	120	53	1	90	28	-35%	30	-25%
Folkestone West	86	1	120	51	1	90	35	-41%	30	-25%
Gravesend	51	2	65	23	2	48	28	-55%	17	-26%
Maidstone West	-	-	-	50	peak only	84			1	-1%
Chatham	42	2	67	38	2	62	4	-10%	5	-7%
Gillingham (Kent)	46	2	71	42	2	66	4	-9%	5	-7%
Rainham (Kent)	52	2	76	47	2	71	5	-10%	5	-7%
Rochester	40	2	71	34	2	60	6	-15%	11	-15%
Strood	63	2	79	34	2	60	29	-46%	19	-24%
Deal	111	1	155	82	1	129	29	-26%	26	-17%
Martin Mill	102	1	146	74	1	121	28	-27%	25	-17%
Sandwich	117	1	161	88	1	131	29	-25%	30	-19%
Walmer	108	1	152	79	1	126	29	-27%	26	-17%
Faversham	68	2	95	63	2	90	5	-7%	5	-5%
Sittingbourne	60	2	85	55	2	80	5	-8%	5	-6%
Birchington-on-Sea	94	2	124	87	1	122	7	-7%	2	-2%
Broadstairs	104	2	133	80	1	115	24	-23%	18	-14%
Margate	99	2	129	86	2	117	13	-13%	12	-9%
Ramsgate	107	2	136	74	1	111	33	-31%	25	-18%
Herne Bay	85	2	114	78	1	113	7	-8%	1	-1%
Whitstable	78	2	107	72	1	106	6	-8%	1	-1%

Source: Steer analysis. Notes: The peak only service at Snodland is excluded from the Table as are the occasional services calling at Westgate-on-Sea. Stratford International is excluded from the Table.

Fares premiums and generalised costs changes

2.23 In addition to the domestic rail service changes facilitated by HS1 there has been a change to the fare structure with premium fares introduced for journeys involving travel on HS1. This premium currently equates to approximately £5 per journey, depending on the station and the ticket type. The following analysis demonstrates the theoretical trade-off between the saving in journey time and the additional fare paid at an aggregate level.

2.24 Shown in Table 2.3 is the average yield on journeys between the stations in this study and London BR (2019). These have been extracted from MOIRA2.2, which is the DfT rail model used for forecasting changes to rail demand and revenue from changes to train services. By isolating the unique high-speed route codes in MOIRA2.2, it has been possible to identify the annual journeys and revenue between the stations by ticket type, and hence the additional premium for HS1 services.

2.25 In addition, the table also shows the change in "Generalised Costs" (GC), which takes account of both GJT and fares changes. While HS1 led to shorter journeys, and hence lower GJT, it also led to higher fares, i.e. a disbenefit for passengers. Converting the fares premium into an equivalent change in GJT using value of time parameters derived from TAG (2018 values and prices) allows the premium to be expressed in terms of minutes and hence able to be combined with the GJT changes.

2.26 The GC change can therefore be either positive or negative, since it combines an improved GJT (negative, representing shorter journey times) and a higher fare (so a positive increase in costs). Where the GC change is negative, this implies that, for an average passenger, the benefit of the shorter journey time outweighs the additional cost (fares premium). Where the GC is positive, this implies that, for an average passenger, the shorter journey time is not worth the fare premium.

2.27 Hence, negative GC changes are generally associated with a higher market share for the HS1-services (more passengers value the faster journey), while positive GC changes are associated with a lower market share (only relatively few passengers value the faster journey times). This pattern is broadly supported by the table, where routes with positive GC and low HS1-share are highlighted in red text.

Summary of changes to international services

2.28 All services to destinations on the continent have journey times decreased by about 30 minutes due to the use of the HS1 infrastructure. There were also marginal increases in service frequencies to 2019, as noted in Table 2.1 above. No data was available to estimate any systematic changes to international rail fares using Eurostar services.

Table 2.3: Average HS1 yield premiums and generalised cost changes to London by origin station (one-way journey)

HS1 Station	HS1 Average Yield	Non-HS1 Average Yield	Fare Premium (£s)	Fare Premium (%)	Pre-HS1 GJT (mins)	Difference GJT (mins)	Fare Premium (mins)	GC Change (mins)	HS1 Demand Share as % of all rail demand?
Ashford International	£14.57	£11.55	£3.02	26%	88	-32	12	-20	75%
Canterbury West	£15.31	£11.99	£3.32	28%	110	-28	13	-15	90%
Ebbsfleet International	£10.70	-	-	-					100%
Dover Priory	£15.58	£12.12	£3.46	29%	124	-30	12	-18	73%
Folkestone Central	£14.37	£11.27	£3.10	27%	114	-31	12	-19	85%
Folkestone West	£14.88	£11.72	£3.16	27%	114	-31	12	-19	85%
Gravesend	£10.21	£7.08	£3.13	44%	63	-17	13	-4	37%
Maidstone West	£13.61	£10.78	£2.84	26%	84	-4	11	7	71%
Chatham	£11.30	£8.93	£2.37	27%	64	-3	10	7	22%
Gillingham (Kent)	£11.34	£8.88	£2.45	28%	67	-3	11	9	25%
Rainham (Kent)	£11.47	£9.03	£2.45	27%	73	-3	10	8	19%
Rochester	£11.03	£9.12	£1.91	21%	70	-13	10	-3	25%
Strood	£11.28	£8.76	£2.52	29%	75	-20	12	-8	45%
Deal	£15.13	£12.95	£2.19	17%	147	-30	8	-22	92%
Martin Mill	£17.76	£13.00	£4.77	37%	142	-31	14	-17	92%
Sandwich	£15.61	£14.55	£1.06	7%	152	-27	4	-22	92%
Walmer	£15.51	£13.36	£2.16	16%	144	-29	9	-19	90%
Faversham	£13.84	£10.90	£2.94	27%	91	-4	12	8	38%
Sittingbourne	£12.57	£9.82	£2.75	28%	81	-3	11	8	23%
Birchington-On-Sea	£13.65	£11.48	£2.17	19%	119	2	10	12	34%
Broadstairs	£14.74	£9.44	£5.30	56%	131	-21	15	-6	72%
Margate	£15.79	£12.05	£3.74	31%	126	-12	12	0	53%
Ramsgate	£14.81	£11.39	£3.41	30%	133	-30	9	-20	79%
Herne Bay	£14.24	£11.22	£3.01	27%	109	0	11	11	29%
Whitstable	£13.77	£11.49	£2.28	20%	102	0	8	9	40%

Source: Steer analysis Notes: The peak only service at Snodland is excluded from the Table. Stratford International is excluded from the Table.

3 Theory of change

Introduction

3.1 In this chapter, we set out the "theory of change" that has underpinned this evaluation. Theories of change are used in both ex ante appraisal and ex post evaluation to establish hypotheses of how an intervention leads to long term changes to society and the economy. In this case, the theory of change relates to how the transport outputs facilitated by HS1 (reduced journey times, higher rail frequencies, etc.) via a number of intermediate steps lead to its impacts – i.e. changes in the scale and distribution of economic activity and social change.

Socio-economic impacts of domestic services

3.2 A key part of the evaluation is to describe the socio-economic impacts which have been observed in the locations benefitting from the domestic high-speed services enabled by HS1. The approach seeks to explore the intended "transformational" nature of HS1 as a transport scheme. Transformational impacts are defined as permanent changes to patterns or the scale of economic activity, which could be one of or a combination of changes to population, employment or the size and nature of a local economy.[4] Our approach aligns with the latest HM Treasury Green Book guidance, which has a renewed focus on the "place-based" impacts of infrastructure schemes, on local housing, employment and economy. According to the Green Book, "Place Based Analysis concerns appraisal applied to geographically defined areas within the UK. This definition includes a wide range of categories such as villages, towns, cities, counties and regions and the home countries that make up the UK, it also includes other geographically-based definitions such as "rural areas" or "areas of urban deprivation".[5] It is also noted that in cases where there is transformational change, it is unlikely that all welfare impacts will be fully captured within a conventional cost benefit analysis.

3.3 We have developed a "logic map", which sets out the relationships between the transport outputs resulting from HS1 and the services that operate on it, and its social and economic impacts (Figure 3.1). In essence, a logic map is a visual representation of a theory of change, that is an a priori hypothesis of how the outputs resulting from intervention deliver outcomes that in turn leads to impacts. This logic map has been informed by similar work done as part of the first evaluation, with a deliberate decision on our part to simplify its presentation While following the same structural relationship between outputs, outcomes and impacts. Often included in logic maps are the context of the intervention and the inputs that have been used (e.g. capital investment, people resources, etc.). For presentational clarity, these too do not appear in the figure. The social and economic logic map has also been informed by

[4] Paragraph A7.2 Appendix A7, HM Treasury (2022) **The Green Book**

[5] Paragraph A2.1 Appendix A2, HM Treasury (2022) **The Green Book**

contemporary thinking on how a transport intervention leads to impacts, as well as current guidance. Definitions of the key terms used in the logic map are found in Appendix A.

3.4 Informed by the logic mapping, the analysis of social and economic impacts of HS1 has sought to assess these indicators of long-term impacts:[6]

- population change
- employment change (by sector)
- housing delivery
- commercial development
- demographic change
- commuting behaviour and employment change
- business growth and Gross Value Added
- foreign direct investment (FDI)
- tourism visits and spend
- local land values.

3.5 Long-term impacts can be difficult to link directly back to specific transport schemes, as they are concurrently influenced by wider demographic and economic trends, as well as policy action and other transport investments. Nonetheless, for areas served by domestic high-speed services we have analysed the available data sources to understand the changes to the indicators listed above – this analysis forms Chapter 4. The econometric analysis that is described in Chapter 5 extends the assessment by undertaking a comparison of HS1-served localities with other places in the South East, with the goal to explore the extent to which there are statistically significant differences between the observed changes in HS1-served areas and other comparable locations.

3.6 It is also important to note that while informed by theory and by previous evaluations, a logic map is an a priori assessment of how an intervention, in this case HS1, is intended to lead to long-term impacts. It is also a simplification of what are complex interactions. Long-term impacts can also be influenced by other interventions, as well as external factors that may affect both the scale and nature of the assessed impacts. Within an area as large and as diverse as the area served by domestic high-speed services the impacts are unlikely to be homogeneous and it should be expected that there will be variation in the scale and nature of impacts between places. Geographic spending and employment patterns are likely to change as greater accessibility brings areas into closer competition. When considering a particular long-term impact, it is plausible that some places do not experience a material positive effect, and may even experience disbenefits. For instance, although the logic map indicates that that HS1 will support employment growth, this does not mean that all areas served by HS1 will experience such growth and do so in a comparable way. The outturn impact will be influenced by other factors, such as local land availability, planning policy and the existing structure of the job market. The logic map should be considered to represent an a priori view on net position.

Quantified impacts on passengers (domestic and international)

3.7 In a comparable way to the socio-economic impacts discussed above, to frame the research questions, we have developed a logic map which sets out the relationships between the outputs and the outcomes, in terms of both the impacts on passengers and the impacts on

[6] As set out in paragraph 1.36 et seq. the availability of data places a limit on the extent that these potential impacts can be investigated.

non-users (Figure 3.2). This too has been informed by similar work done as part of the first evaluation, but with a simplified presentation. As with the logic map for social and economic impacts, while informed by theory and previous evaluations, this is an a priori view of how HS1 has led to impacts. It also represents a net position. Definitions of the key terms used in the logic map are found in Appendix A.

3.8 Informed by the logic mapping, the first key question the analysis explored is what is the scale of the transport outputs that HS1 has enabled, namely:

- What are the rail GJT benefits between the Outturn and Counterfactual Scenario timetables for key flows (both international and domestic)?
- What is the average fare difference between the Outturn and Counterfactual Scenario and what does this mean for overall rail revenue as well as user charge impacts?

3.9 It then went on to consider:

- How has the introduction of higher fares for domestic high-speed services affected demand both on the high-speed services and on the remaining services exclusively using the classic network at lower speeds?
- To what extent has there been a change in crowded minutes for domestic rail passengers?
- To what extent has train service performance improved between the Counterfactual and Outturn Scenarios due to the greater reliability and increase in capacity generated by HS1?
- To what extent has there been mode shift towards rail in the Outturn against the Counterfactual Scenario (primarily focused on international) and what does this mean in terms of user benefits to passengers and non-user benefits (such as lower aviation-related carbon emissions)?
- How has overall rail demand been affected?

Figure 3.1: Logic map for social and economic impacts

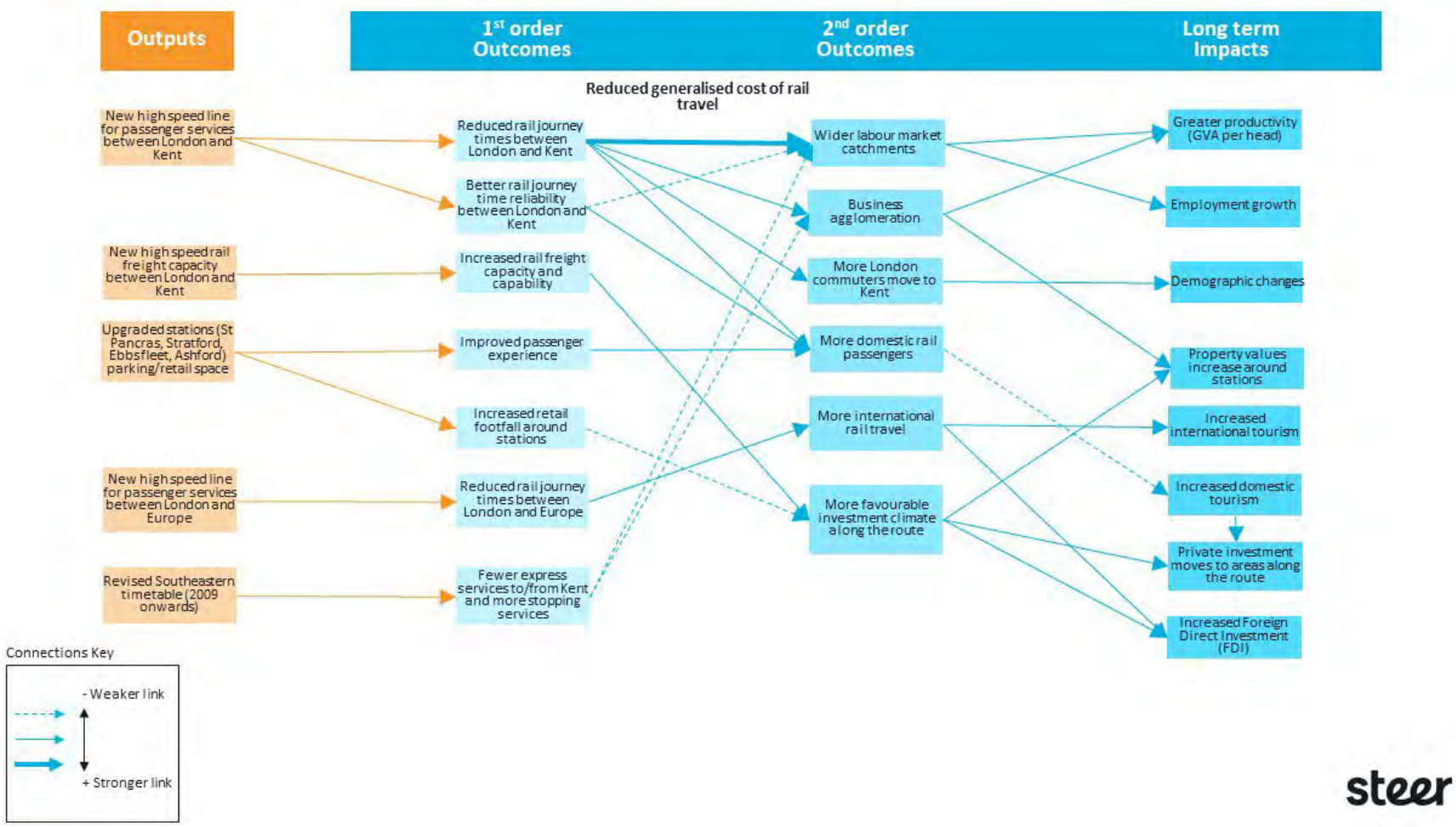
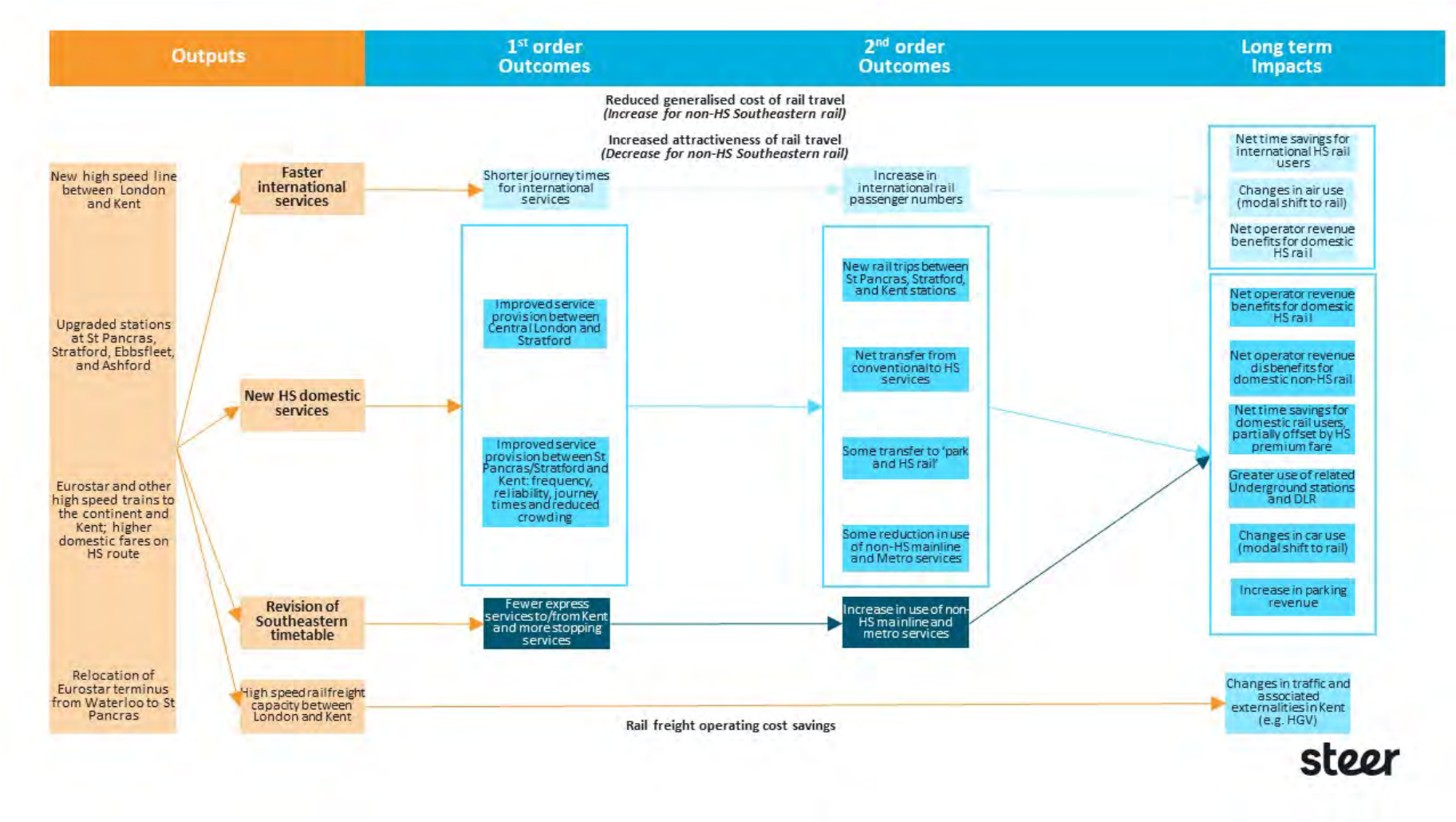


Figure 3.2: Logic map for transport impacts



Source: Steer

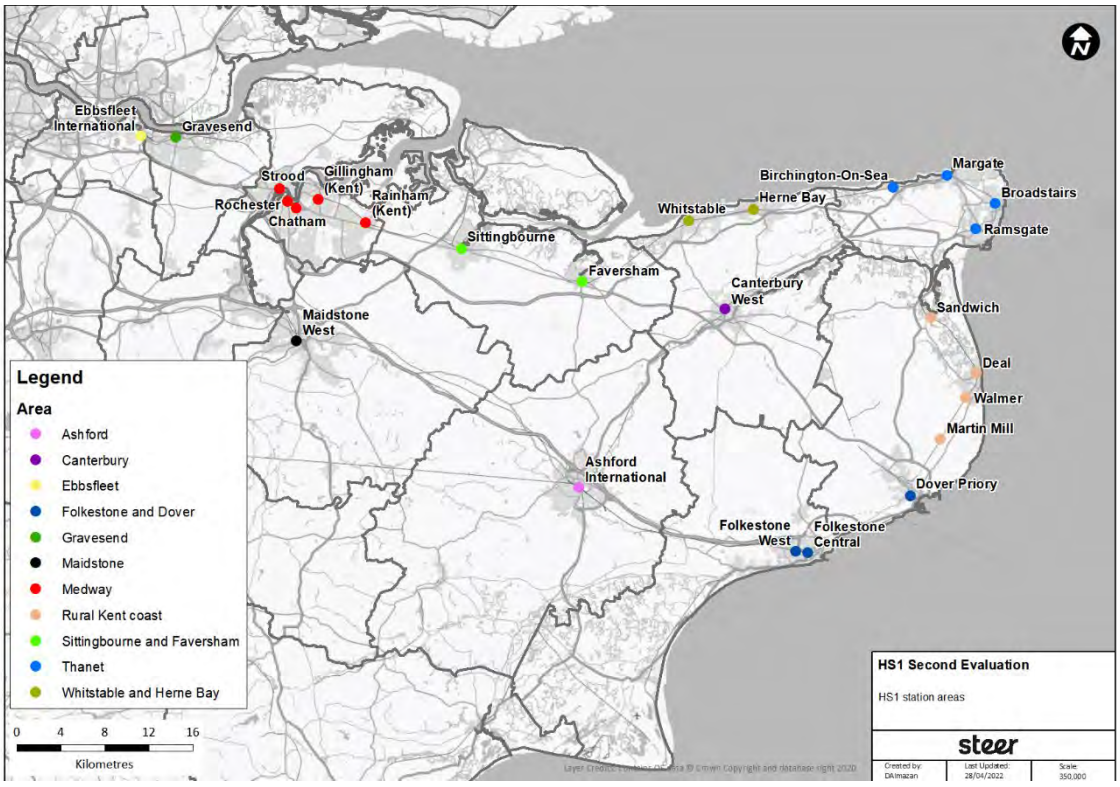
Geography – domestic services

3.10 In order to facilitate and better illustrate the analysis set out in Chapter 4 of the impacts of HS1 and the domestic high-speed services on locations in Kent, we have identified the following geographical areas based on the stations served as an appropriate level of granularity, taking account of the nature of the high-speed services in those locations (service frequency and journey time to London). These station groupings also reflect the socio-economic similarities of places – e.g. the Thanet coast has a more developed and tourism based economy, whereas the 'Rural Kent Coast' stations have an older and more residential population. The Medway towns form a single conurbation and outcomes at each station are therefore likely to be closely related.

- Ashford
- Canterbury
- Ebbsfleet
- Folkestone and Dover
- Gravesend
- Maidstone
- Medway (Rochester, Strood, Chatham, Gillingham, Rainham)
- Rural Kent coast (Sandwich, Deal, Walmer, Martin Mill)
- Sittingbourne and Faversham
- Thanet (Burchington-on-Sea, Margate, Broadstairs, Ramsgate)
- Whitstable and Herne Bay.

3.11 These are shown on the map in Figure 3.3 below.

Figure 3.3: Geographical areas with high-speed services



Source: Steer

4 Socio-economic impact trends

Introduction

4.1 This chapter sets out our assessment of the observed socio-economic impact trends resulting from the introduction of the domestic high-speed services, based on the 11 stations/station groups set out from paragraph 3.2 above and illustrated in Figure 3.3.

4.2 We then present the observed outcomes, i.e. the historical development of socio-economic indicators in each of the 11 geographies. Detailed “dashboards” of relevant information are presented in Appendix C.

4.3 An econometric analysis, identifying the socio-economic impacts against a synthetic control in each of the 11 geographies, to allow the HS1-specific impacts to be isolated from other trends, is set out in Chapter 5. In addition, we look at the impacts on businesses.

4.4 Linked to this analysis, in Chapter 6, we present our qualitative analysis, complementing the quantitative results presented in this chapter. The qualitative analysis is based on interviews with stakeholders.

Descriptive analysis

4.5 We carried out descriptive analysis of the data gathered from the data sources set out in Appendix B to assess the research questions. This looked at both overall trends in the data and compared them to the broader trend in Kent and the South East of England. This enabled us to identify where it is more likely that changes are related to local effects.

4.6 We also considered this against changes in rail usage, looking at both the overall passenger numbers and specifically at journeys to and from London. Traffic to London is the largest flow for most of the stations served by HS1 domestic services, and can provide additional insight into the nature of economic change when combined with other variables. For example, a larger increase in travel from London to a given station than the reverse could reflect either more businesses setting up in the town, or an increase in tourism.

4.7 This analysis is descriptive rather than being designed for statistical testing to attribute causality. However, it does enable us to start testing the theories of change and to understand where there have been local impacts that could potentially be linked to HS1.

‘Impact area’ definition

4.8 A series of ‘impact areas’ have been defined, where it is expected that HS1 would have generated local impacts from both the improved access to the rail network for all trip purposes (stations as trip origins), and from the improved access to markets, including customers, suppliers and potential employees (stations as trip destinations). As previously noted, we are considering here only the impacts of domestic high-speed services, not the international services. The focus is on impacts in Kent, as impacts at the London end of the route are out of scope of this study (as described at paragraph 1.13 above).

4.9 For data available at Middle Super Output Area (MSOA) level or lower, using GIS analysis we reviewed two sets of 'impact areas':

- a 'local' catchment of 800 m from HS1 stations, broadly equivalent to a ten-minute walk
- a 'wider' 4 km catchment, which is around a ten-minute drive-time depending on highway access. This reflects the findings of earlier work for DfT which found that, on average, 85% of outbound station users live within 4 km of the station they are using.[7]

4.10 Where nearby stations are grouped in this analysis, the catchment areas are formed by the outer boundary of the individual station catchment areas.

4.11 Where possible, we have looked at a time series from around five years before HS1 domestic services started operating up to 2019, although not all datasets we have considered are available for this time period. Overall, over this time period there is little noticeable difference between trends for the 800 m and 4 km catchment areas. However, year-on-year, data for the 800 m areas are more volatile, as is to be expected for smaller area data. Therefore, we have focused on the 4 km catchment areas to identify broader trends. The exception to this is population, where in some areas there is a noticeably larger increase in the 800 m 'local' area when compared with the wider 4 km area.

4.12 The analysis includes the entire MSOAs where at least 20% of the urban area of the MSOA is within the 4km catchment. This enables capture of the overall impacts without over emphasising areas which are not substantially part of the urban area around the station. This threshold was set following review of the data, and reflects the close geographical proximity of some of the stations and station groups within the study area.

4.13 Where data is not available at a fine-grained geographic level we have used the smallest possible geographical unit, generally local authority level. This makes it more likely any potential HS1 effect is swamped within the data by other factors.

Summary of findings

4.14 There have been major economic changes within some of the station areas sampled: not all of these will be directly related to HS1, but it may have had some effect. These are described for each of the 11 stations or stations groupings set out in paragraph 3.2 above.

4.15 **Ashford** received a substantial improvement in journey times following the introduction of HS1. The population in Ashford increased by 13% from 2009 to 2019, more so than other areas in Kent and the South East. There was much faster population growth (27%) in the area within walking distance of the station, which in conjunction with the increase in rail usage suggests that the rail service has been a factor in that growth.

4.16 Employment growth, however, was around average: we would not expect this to be the case if the additional population were working locally. It therefore implies that they could be commuting from Ashford into London – rail travel to London increased by 68% above the average for the South East. There was also a greater than average increase in rail traffic from London to Ashford, indicating that the town has become a more attractive destination.

4.17 Journeys from **Canterbury** to London are faster than they were before HS1, but the station is still only served by one fast train an hour. Rail usage and population both grew faster than comparators, particularly from 2013 onwards. This lag from the introduction of high-speed

[7] Steer Davies Gleave (2018) **Economic Impacts of New or Improved Rail Lines**

services in 2009 suggests growth may not be strongly linked to HS1, or may reflect a delay in planning policy taking account of the improved rail services.

4.18 Employment growth and growth in GVA per capita were both relatively low in Canterbury, substantially below the average for the region. This probably reflects the unusual population in Canterbury, with a very high (and growing) ratio of students to permanent residents. This could also be behind the trend of declining commercial floor space, as commercial properties are converted to student accommodation. Low rates of GVA growth can also be consistent with growth in out-commuting, with a greater proportion of residents contributing to GVA at their place of work which is elsewhere.

4.19 Data for **Ebbsfleet** should be interpreted carefully: prior to the station opening it was not a clear residential centre, with the population centred in Dartford and Gravesend. As a result, a combined set of dashboards has been produced for Ebbsfleet and Gravesend. The population and commercial floor space grew towards the end of the study period, following the announcement and start of construction of Ebbsfleet Garden City. Employment and GVA are quite volatile compared with the regional averages, which could be linked to the volume of construction work and the scale of ongoing development in the area. Over 2,800 new dwellings were constructed in the Ebbsfleet area between 2009 and 2019.

4.20 Station usage has steadily grown over the period, with a particularly high growth in journeys towards London (as opposed to originating from London). **Ebbsfleet** has been promoted as a 'park and ride' station and is likely to attract rail passengers who would otherwise use alternative HS1 served stations.

4.21 HS1 service to the stations at **Folkestone and Dover** improved journey times to London by around 35%, although the stations still only receive one fast train per hour. Rail usage has increased, with a particularly high increase in travel to Folkestone and Dover from London relative to the average in the South East, suggesting the area has become a bigger attractor of rail journeys. Population growth is in line with the regional trend, but employment dropped significantly in 2012 and then remained flat, below the growth seen in other areas in Kent and the South East.

4.22 **Gravesend** received a very large improvement in journey times as a result of HS1, with travel times to London dropping from 51 minutes to 23 minutes. This is not however reflected in rail usage: overall station usage grew at the same rate as the South East as a whole, and journeys to London stations only grew by 3% between 2009 and 2019. It is noted that Ebbsfleet International is a close alternative to using Gravesend, which as well as offering considerably more parking spaces (nearly 5,000 compared with fewer than 100 at Gravesend), also offers more frequent services to St. Pancras.

4.23 Population and employment at Gravesend did increase above the regional average. Employment growth was concentrated in sectors such as Transport and Storage and Accommodation and Food Service, which are not generally linked to rail commuting or business travel.

4.24 Travel to and from London to **Maidstone** was flat over the period studied. The population immediately around the station (Maidstone West) increased substantially over the study period, well above the average for Kent and the South East. This was not reflected in the wider 4,000 m area, where growth was only slightly above average. This suggests that densification in the area around the station is happening, but that this is not linked to greater outward commuting by rail.

4.25 Employment growth, however, was below average: most sectors shrank over the period, with the exception of business administration and support services.

4.26 While there was a decrease in journey times from the **Medway** stations to London, this was relatively small and has not been reflected by a growth in rail usage and it therefore seems unlikely that local socio-economic trends would be strongly linked to HS1. Population and employment growth was very similar to the regional average, with no clear trends.

4.27 Service quality to the **rural Kent Coast** (Deal, Martin Mill, Sandwich and Walmer) improved following the introduction of HS1 domestic services, but usage of the stations did not increase above the trend for the wider South East until 2015: this suggests it is unlikely to be a direct response to the improved service. Population and employment in the area both grew below the regional trend over this period of time, with the employment level decreasing by 8% from 2009 to 2019.

4.28 **Sittingbourne** and **Faversham** showed no increase in overall rail travel, well below the average for the South East. Population and employment growth were slightly above the average for Kent and the South East, and there was higher growth in commercial floor space.

4.29 Rail usage of **Thanet** stations (Birchington-on-Sea, Broadstairs, Margate and Ramsgate) increased substantially from 2015 onwards. There was a particular increase in travel to Thanet from London: given the timing this is likely to reflect the increased popularity of the area as a visitor destination noted by stakeholders (see Chapter 6) rather than the improvement in services from HS1.

4.30 The change in journey times from **Herne Bay** and **Whitstable** following HS1 was minimal. Overall growth in rail usage to the station was at the same level as the rest of the South East - travel from London did increase substantially from 2015 onwards suggesting an increased popularity as a visitor destination. Population and employment growth were similar to the regional trends in Kent and the South East, although population growth in the immediate area of the station was flat, below the regional trend.

Dashboards

4.31 The following pages show “dashboards” for each of the 11 stations/stations groups with key indicators, including:

- Map of the “impact area” for the relevant station/station group with the 4 km radius
- Impact of HS1 on journey times and train frequencies
- Station usage
- Rail journeys TO London (journey origin at featured station/station group)
- Rail journeys FROM London (journey origin at London)
- Population
- Employment.

4.32 Note that due to their close proximity, in addition to the individual dashboards for Ebbsfleet and Gravesend stations, we have also created a dashboard for these two stations combined.

Figure 4.1: Socio-economic dashboard: Ashford

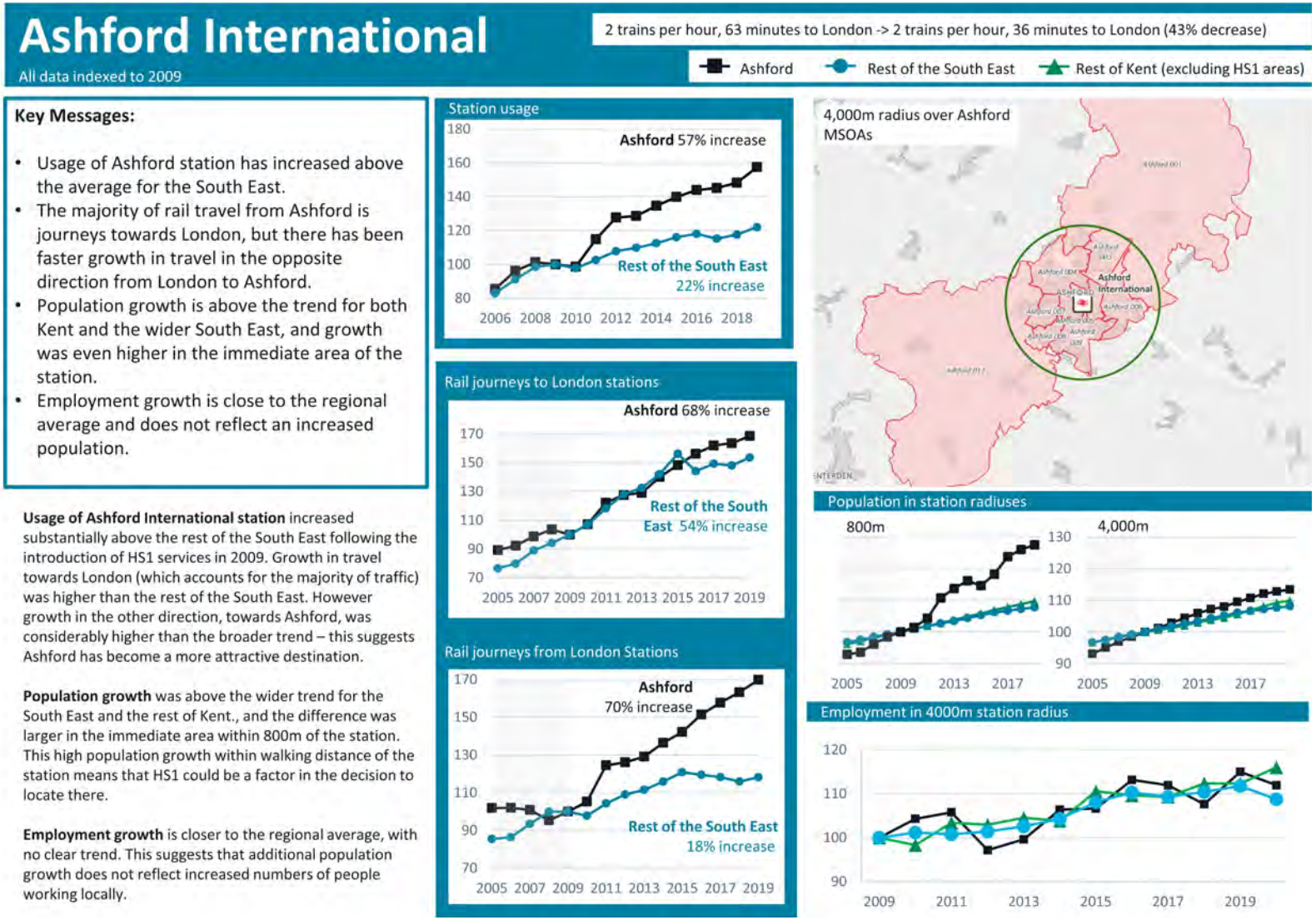


Figure 4.2: Socio-economic dashboard: Canterbury

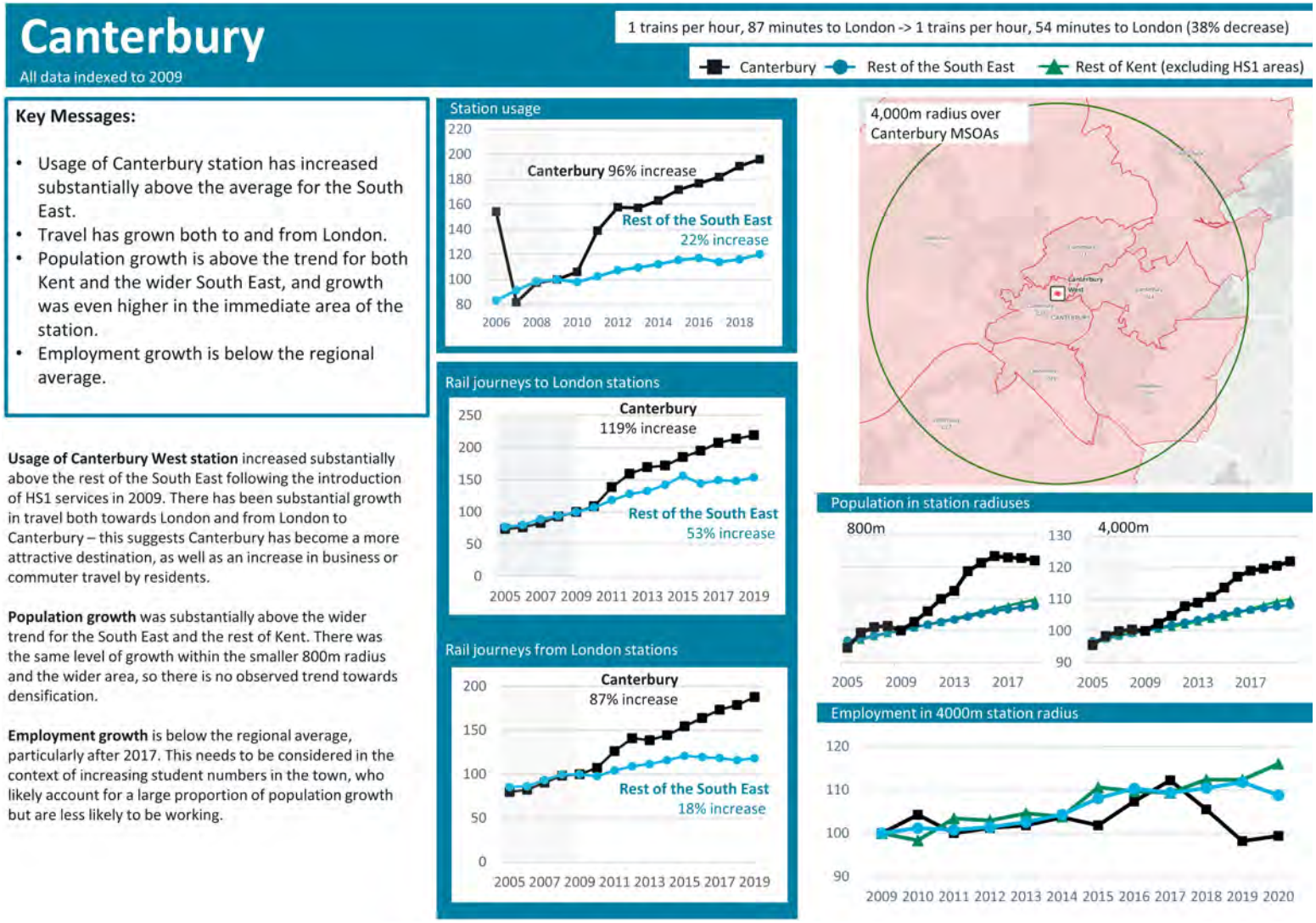


Figure 4.3: Socio-economic dashboard: Ebbsfleet

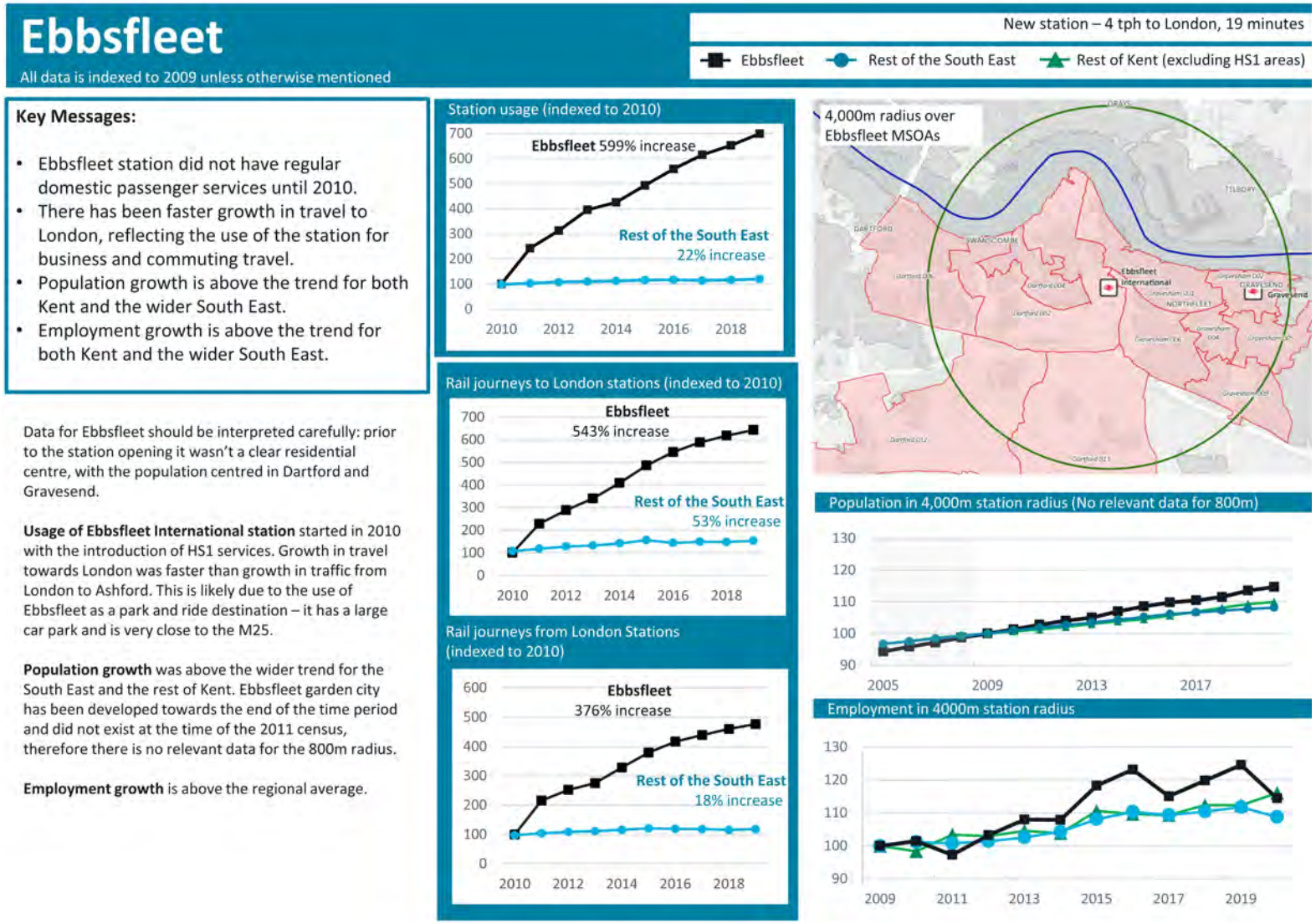


Figure 4.4: Socio-economic dashboard: Gravesend

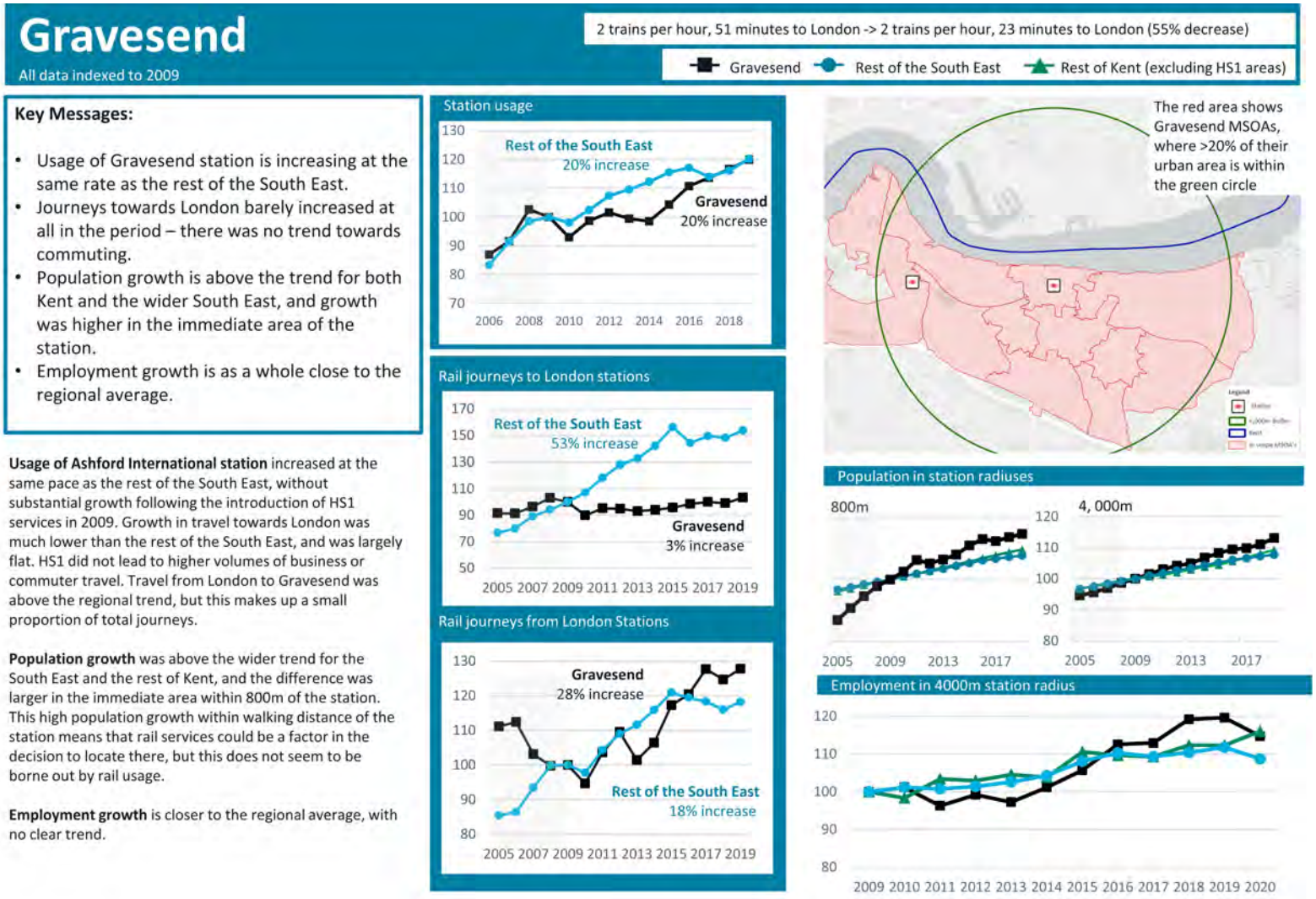


Figure 4.5: Socio-economic dashboard: Ebbsfleet and Gravesend taken together

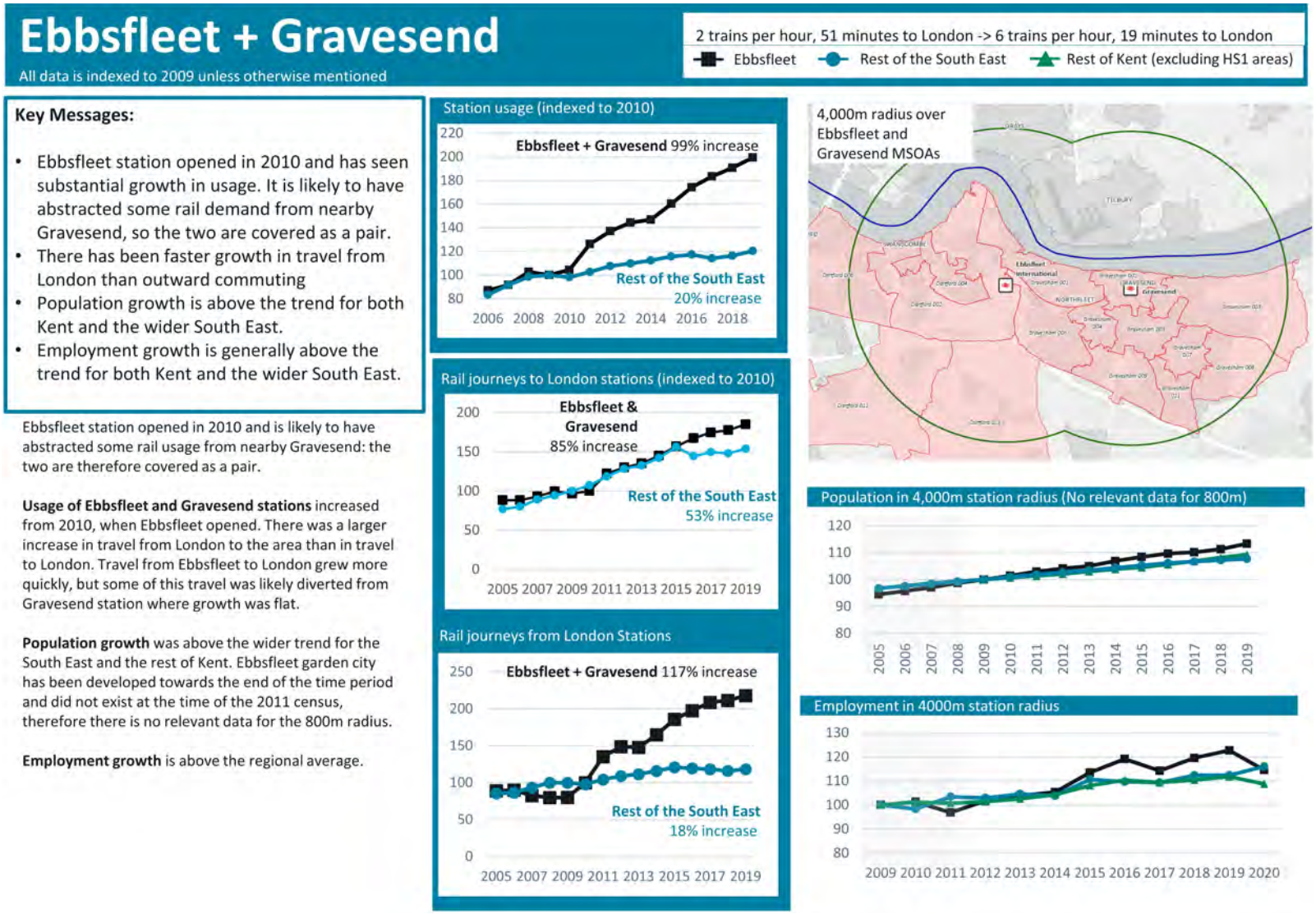


Figure 4.6: Socio-economic dashboard: Folkestone and Dover

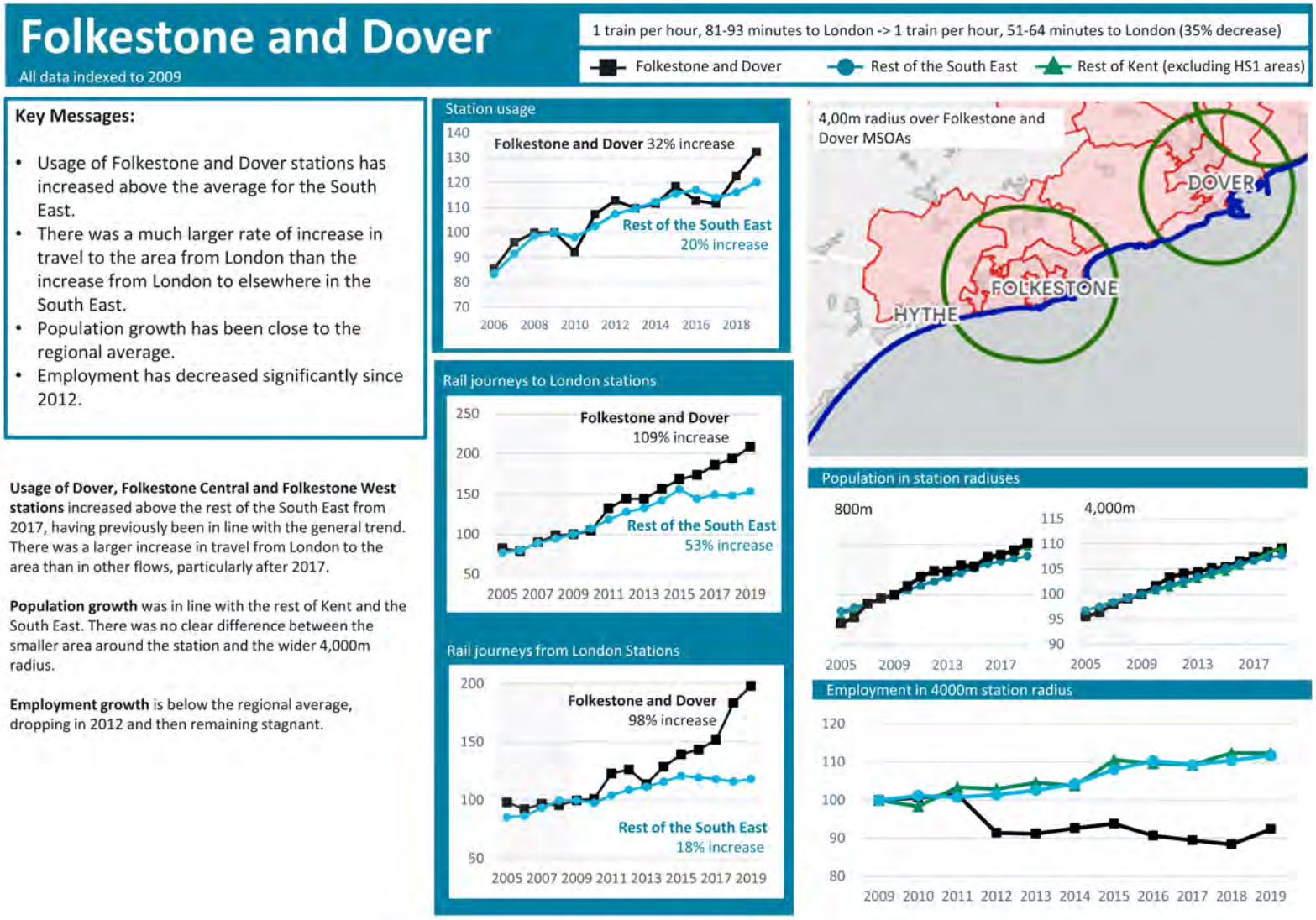


Figure 4.7: Socio-economic dashboard: Maidstone

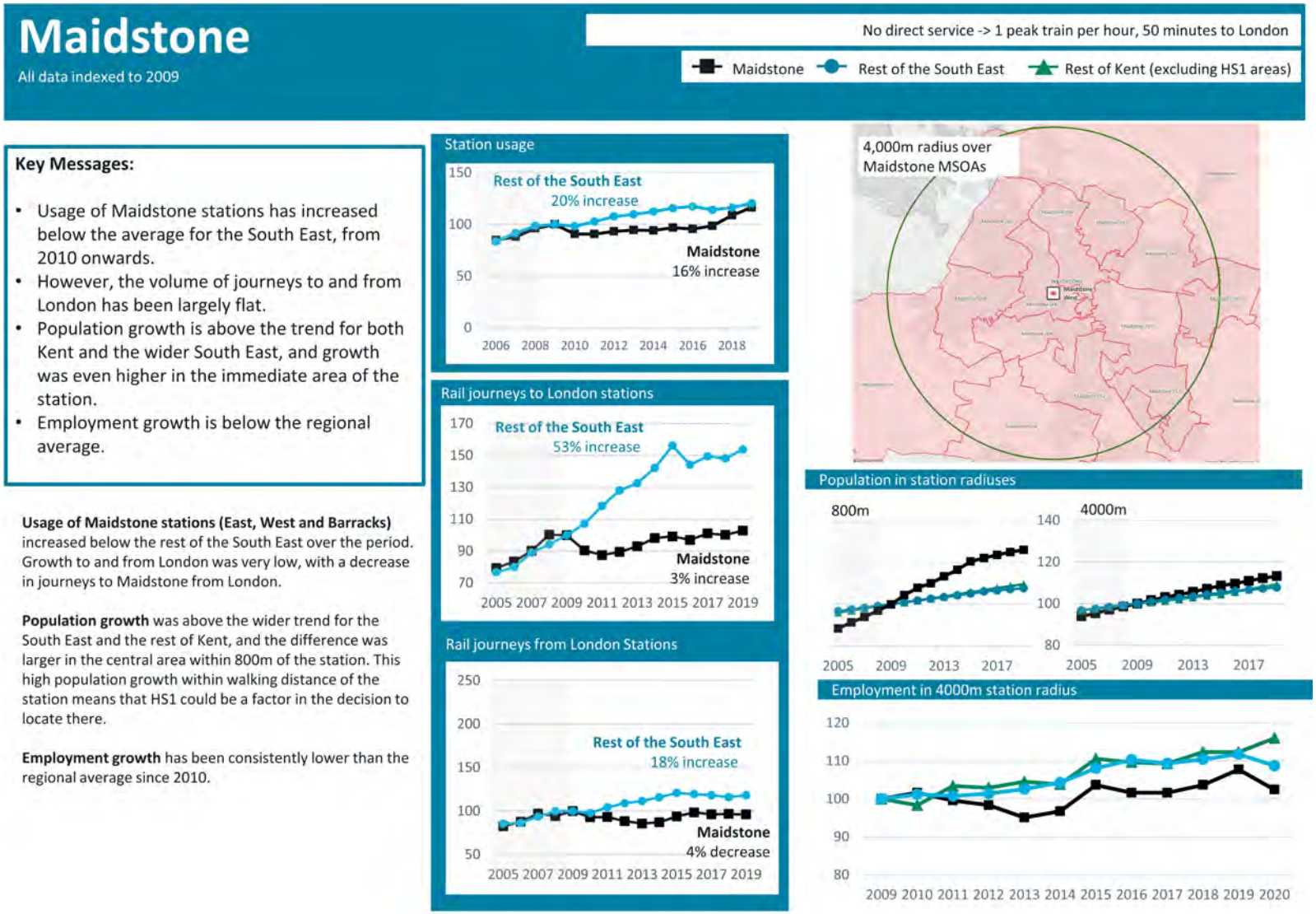


Figure 4.8: Socio-economic dashboard: Medway

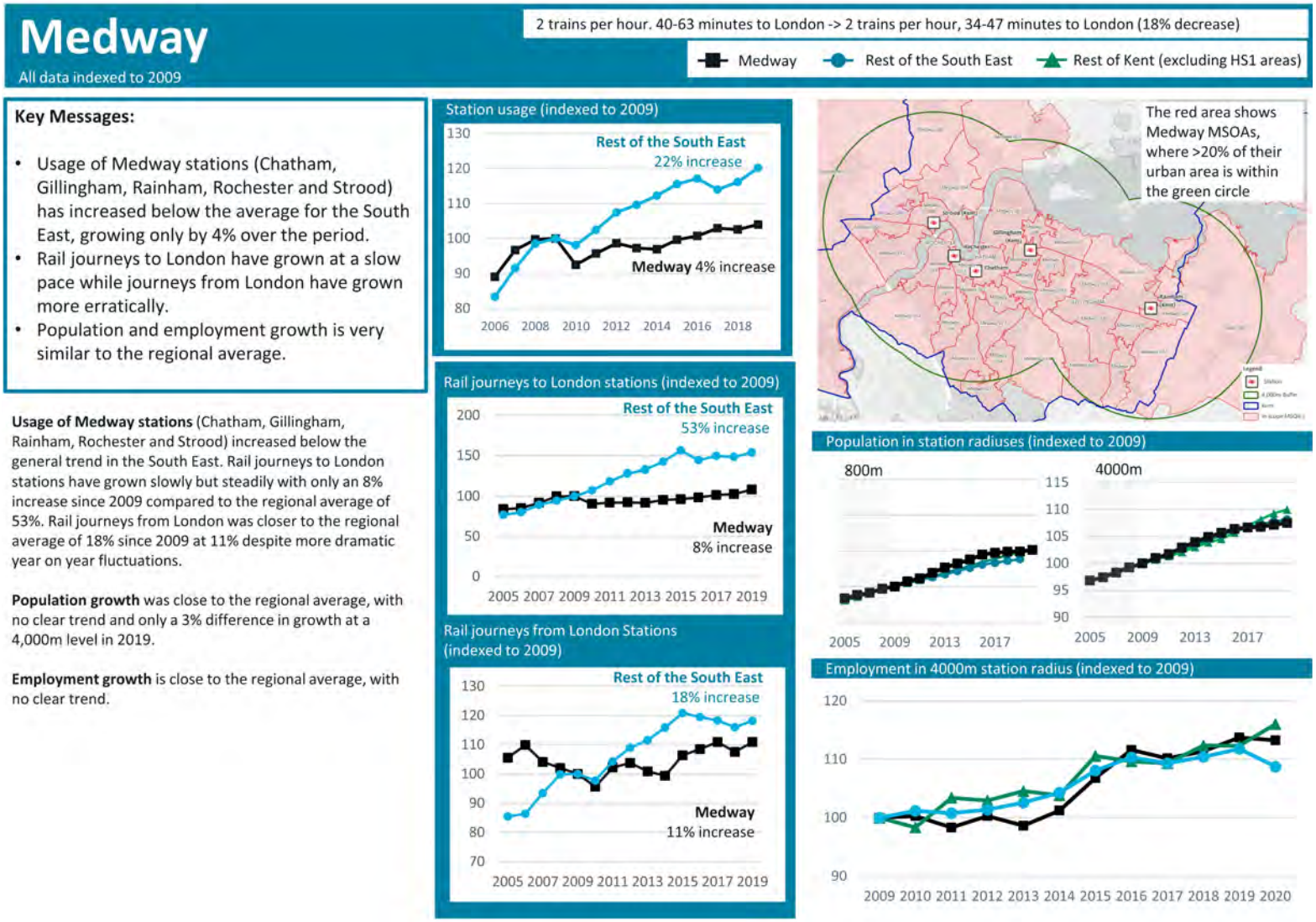


Figure 4.9: Socio-economic dashboard: Rural Kent Coast

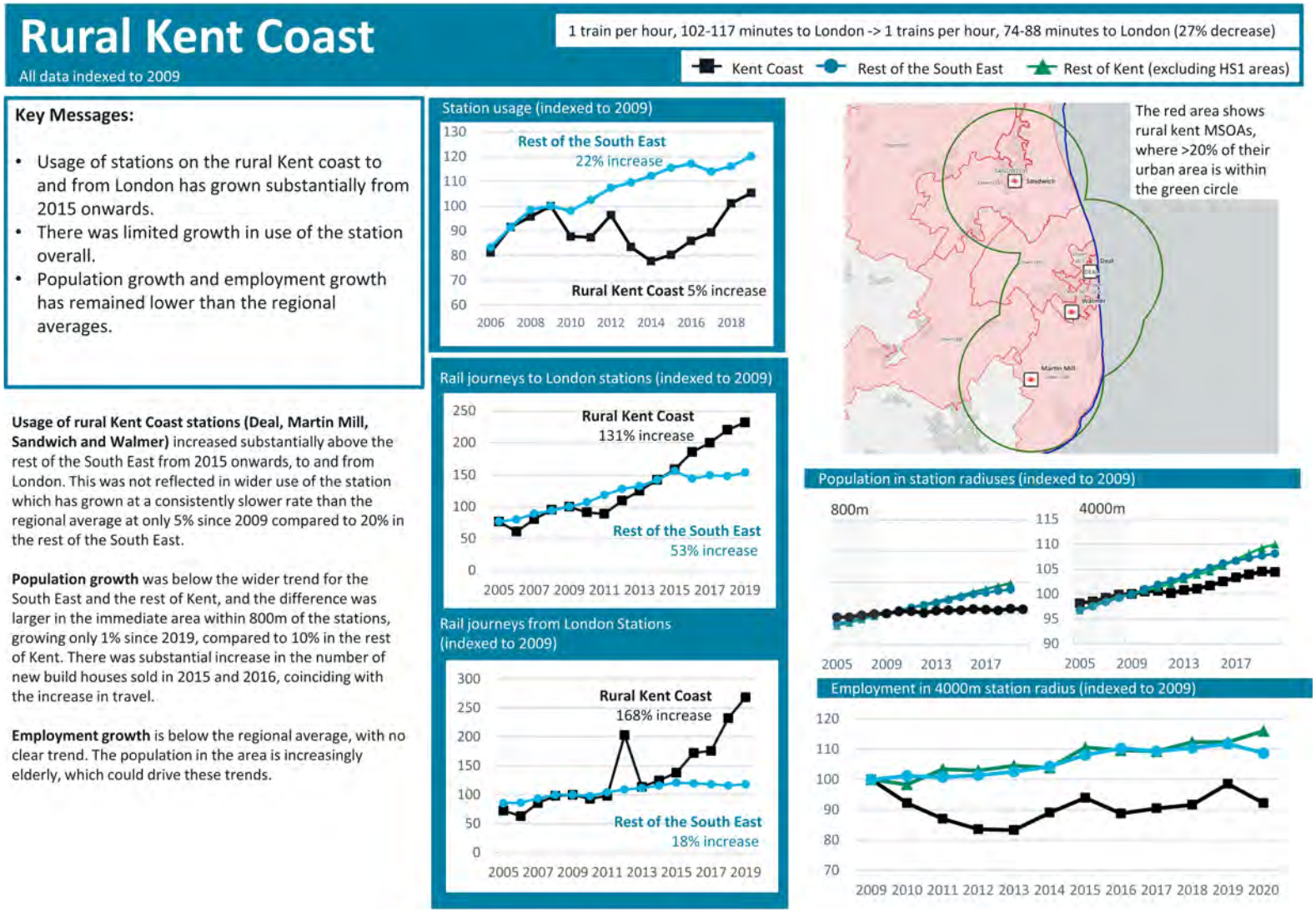


Figure 4.10: Socio-economic dashboard: Sittingbourne and Faversham

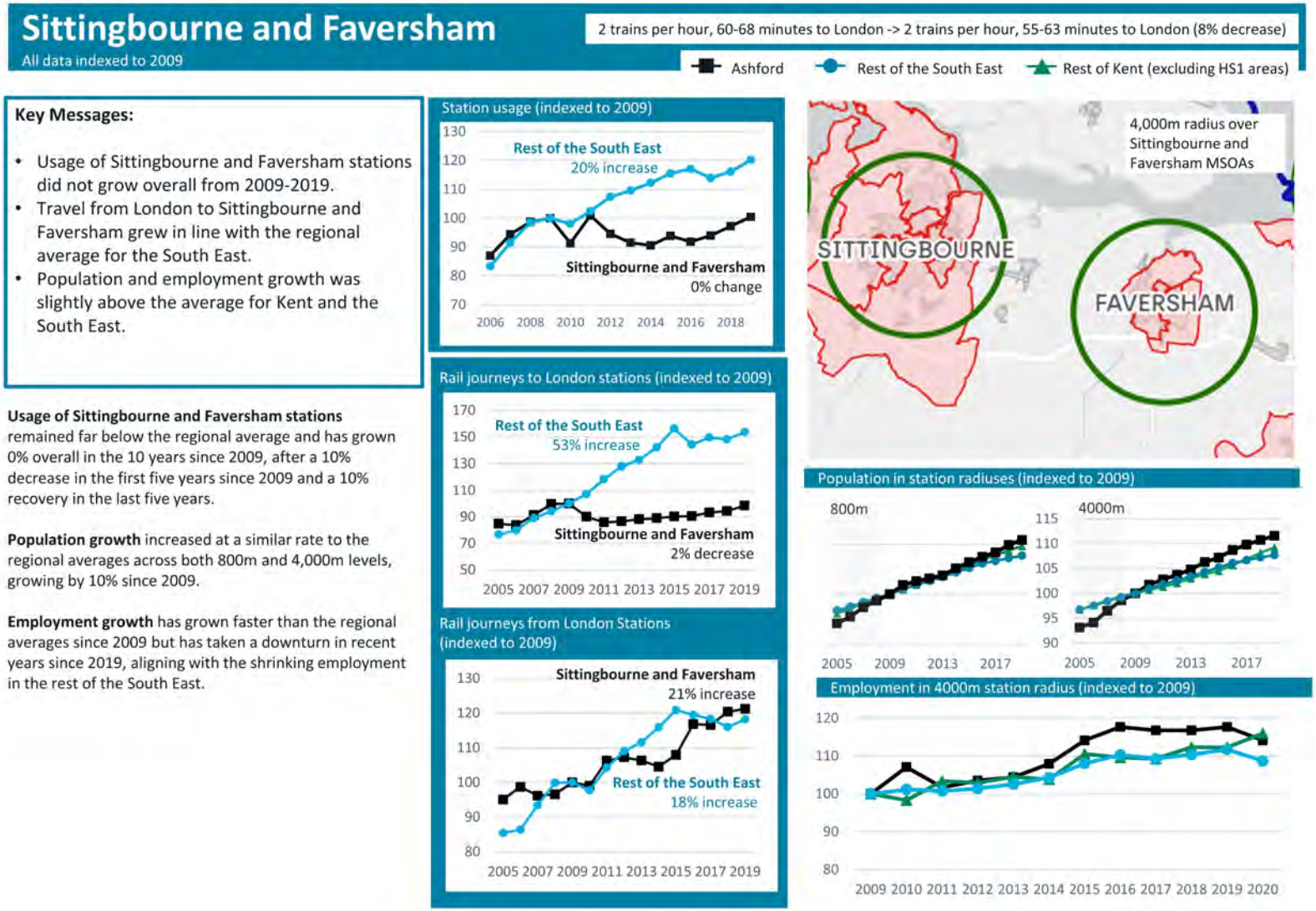


Figure 4.11: Socio-economic dashboard: Thanet

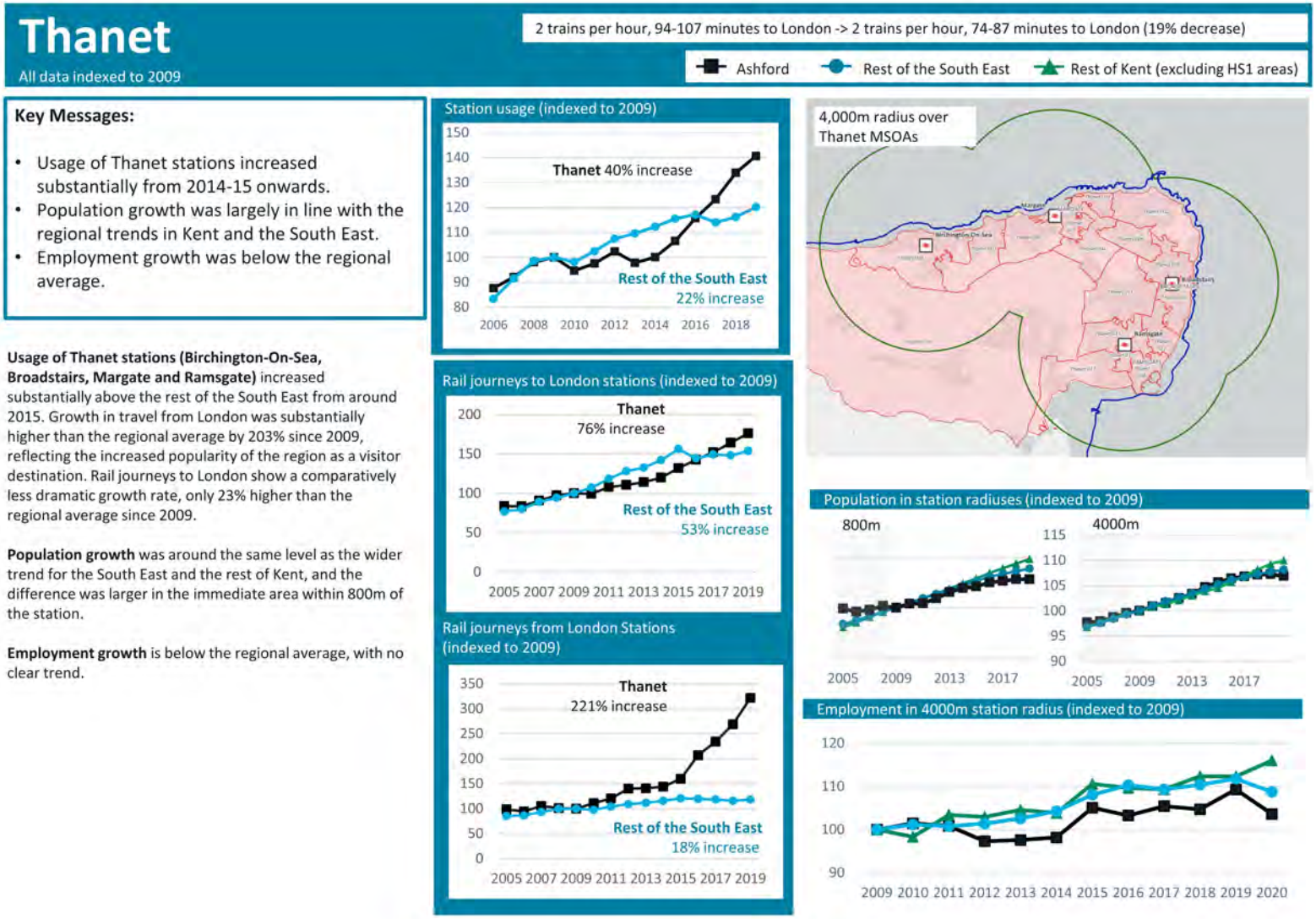
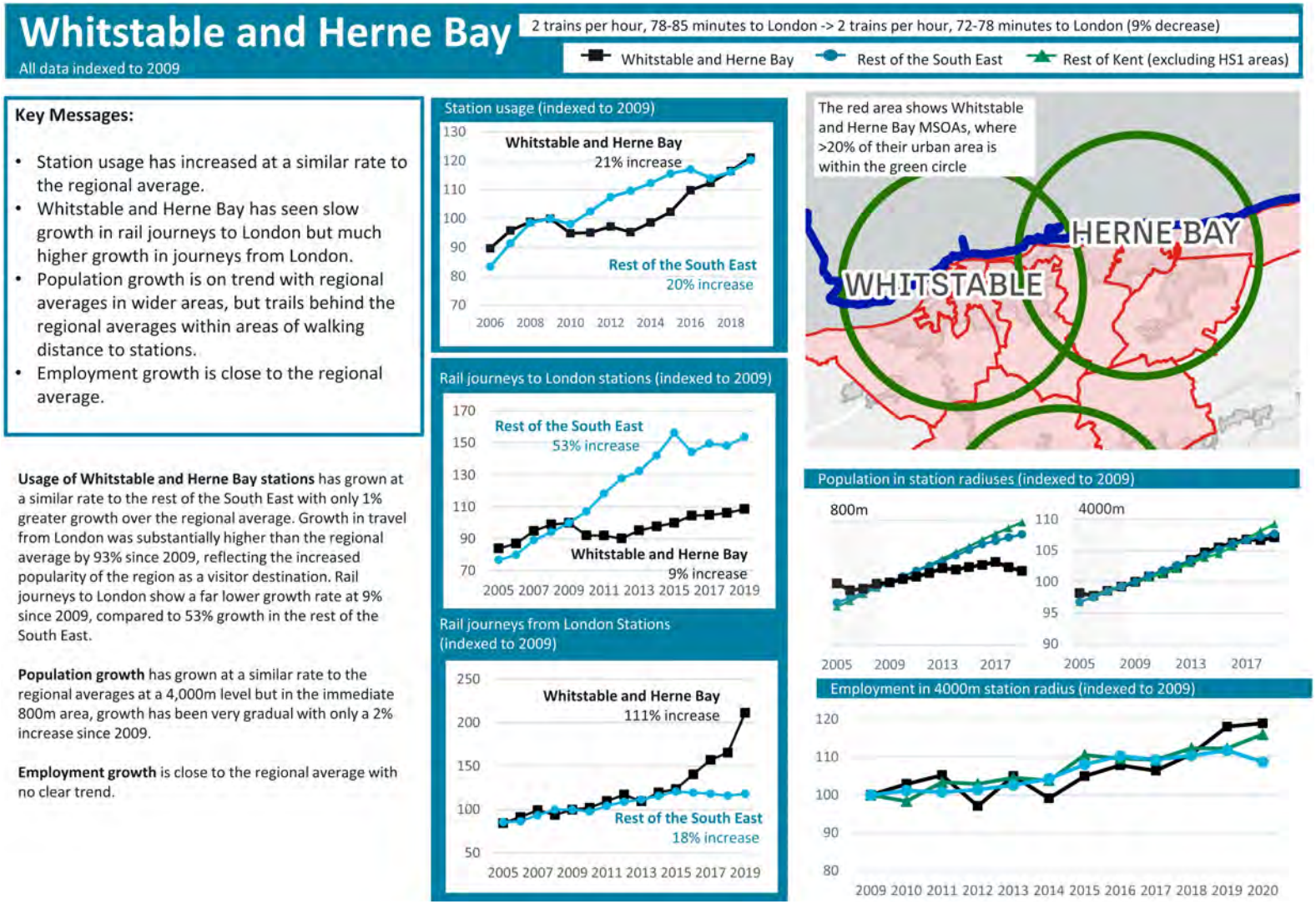


Figure 4.12: Socio-economic dashboard: Whitstable and Herne Bay



5 Econometric analysis

Introduction

5.1 The objective of the econometric analysis is to test some key data metrics to identify the extent to which the areas and localities around the HS1 stations are positively affected by the enhanced connectivity offered by HS1 domestic rail services. That is, the analysis asks the question, "to what degree has the HS1 domestic high-speed services specifically supported the economic development of the areas and districts around the stations served?" This stage follows on from the analysis of observed effects reported in the previous chapter to analyse what might be driving those effects. The econometric analysis uses techniques to compare impacts on a set of data indicators from 'treated' HS1 stations to 'non-treated' stations serving localities with similar characteristics. The objective is to identify the counterfactual impacts – those that occurred anyway in non-treated areas – and to isolate impacts that could be attributable to the 'treatment', i.e. the HS1 domestic services.

5.2 To achieve this, firstly the impacts that might be expected can be identified within a 'theory of change'. This sets out the changes we could expect to see as a result of the introduction of HS1 services. The theory of change is the subject of Chapter 3. The econometric analysis then helps to identify if those changes are likely to be attributable to the HS1 domestic services or not. Key data metrics are chosen that provide a means of measuring the change.

5.3 The theory of change describes how we might expect to see places change and develop in socio-economic terms, as a result of the enhanced connectivity – specifically to London – offered by HS1 domestic services. Given the brief to assess the socio-economic impact of HS1, the theory of change was centred on population and residential impacts, and business impacts. Importantly, the theory had to be measurable with data sources available across the intervention period.

5.4 It was considered important to differentiate between the categories of population-orientated change and measurements and the categories of business-oriented change and measurements, because the effects of an area made more attractive to live and the effects of an area made more attractive to do business, will not be the same. As such, it would be relevant to identify the circumstances where one change has occurred without the other, and what the causes of this may be. The link between the theory of change, associated output measures and data sources is set out in Table 5.1 below.

Table 5.1: Theories of Change and Measurement

Theory of Change	Output Measurement	Data Sources
Area becomes attractive as a residential location due to enhanced workplace accessibility, generating additional population, increasing demand for housing and services.	House Prices, Population, GDP	Land registry, ONS/Nomis data
Area becomes attractive as a business location due to greater labour market access, resulting in businesses moving into areas around stations, increasing employment and turnover	Business population, business employment, turnover, productivity	IDBR* firm data
Businesses from knowledge-based sectors in particular are attracted to locate around HS1 stations	Numbers of knowledge-based sectors	IDBR* firm data – SIC classifications
Retail activity increases due to increased footfall and economic activity around stations	Numbers of retail businesses	IDBR* firm data – SIC classifications

*Inter-Departmental Business Register
Source: Cambridge Econometrics analysis.

5.5 Of particular interest in the analysis are the effects of the service in respect of its specific function to enhance connectivity to and from London. This refers to the point that the analysis is effectively considering the impacts on towns in Kent of offering a faster connection to and from London, rather than the impacts of simply improving connectivity overall.

5.6 We know from analysis of passenger data (in Chapter 7) that passenger demand has increased substantially at many high-speed domestic service served stations so it will be of particular note to observe what the impacts of increased London commuter numbers might be on the HS1-served towns, particularly those that have the largest increases in demand for high-speed domestic services.

Econometric Approaches

5.7 A two-phased approach has been applied to test these theories of change and, specifically, indicate the degree to which the HS1 domestic services may be responsible for the change. The aim of the first phase is to assess the broad socio-economic impacts of enhanced rail connectivity at the Local Authority District (LAD) level. The value of assessing impact at this level is to identify how mainline rail connectivity enhancements can affect broader local geographies around stations. This relates to the theory of change of an area becoming more attractive as a residential location, and if this can apply at the district level.

5.8 For the second phase, the analysis focuses on the economic impact in the area immediately around high-speed domestic served station localities. This is based on an analysis of the behaviour and performance of firms using data from the ONS Inter-Departmental Business

Register (IDBR). This aim of this phase is to understand the impacts of enhanced connectivity on businesses and the business environment in the station localities.

5.9 For both phases, econometric techniques are used to select or devise comparators with which to compare the outputs of the 'treatment' areas to the 'non-treatment' areas to determine a level of impact.

Phase 1 – broad socio-economic impacts

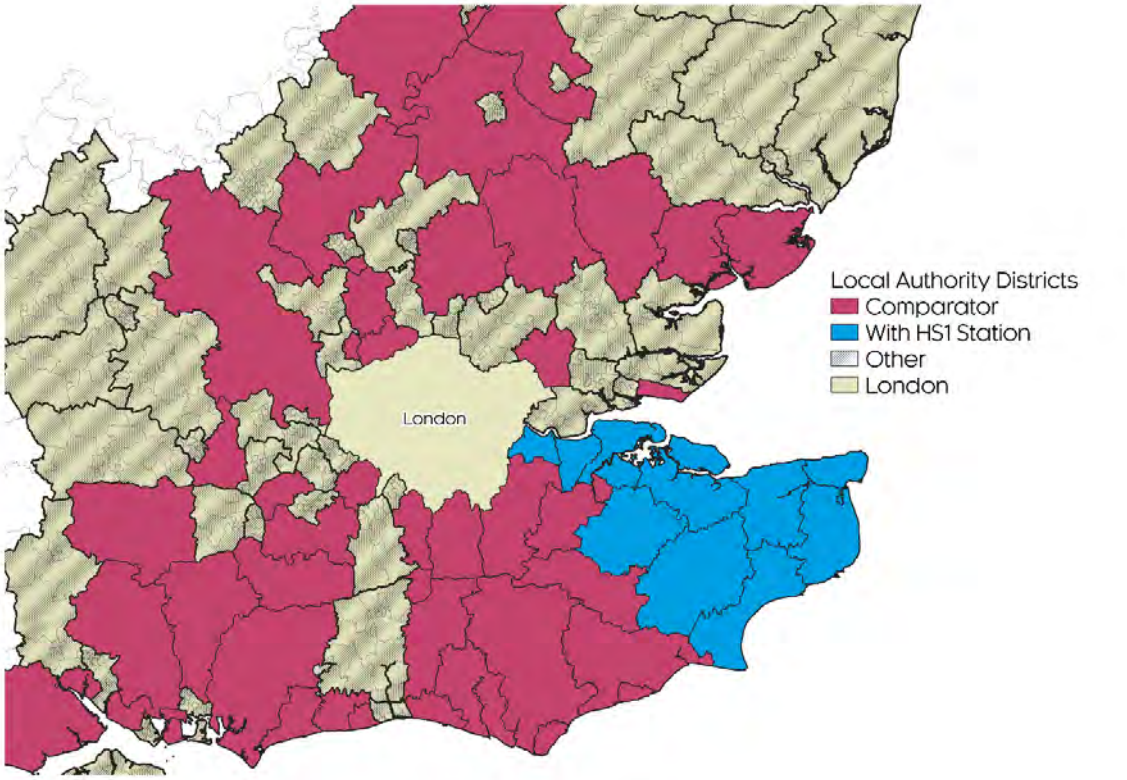
5.10 For the first phase, the 'Synthetic Control Method' was used. This was because it is the most effective with the sample size available (see Appendix D for rationale). For this method, treatment LADs are compared with non-treatment LADs, selected for the similarity of key socio-economic characteristics. Then a 'synthetic' LAD is devised by taking the characteristics across all the comparison areas and selecting those that are most similar to the treated area The comparison characteristics are referred to as 'matching variables'. The difference across the matching variables is minimised to find the most suitable area. Synthetic Control Method shows which areas the 'synthetic control area' is made up from. This transparency allows us to examine any idiosyncrasies of treated and control areas that cannot be captured by the estimation.

5.11 The effect of this approach is to hold the matching variables constant between the treated and non-treated areas so that the effect of the treatment on the selected output metric – such as GDP or population – can be observed by comparing it with that of the synthetic control.

5.12 To observe the effects of the treatment, a time series of data is required that ideally takes in a period before and after the treatment. In this example, this means a period prior to the introduction of HS1 domestic services in 2009, and a period after the introduction of the services. This is possible now that a decade has passed since the services were introduced.

5.13 The map at Figure 5.1 shows the comparator districts used for the synthetic controls and the HS1 districts.

Figure 5.1: Local Authority Districts: Those with HS1 services and those used for Synthetic Controls



Note: Only stations with available data are shown.
Source: Cambridge Econometrics

Phase 2 – economic impacts around HS1 stations

5.14 The second phase focuses on the economic impacts on the localities around the HS1 stations, derived from 'firm-level data', obtained from the IDBR. These metrics include measures of firm performance and employment, as well as the location of firms. It allows the movement of firms to locations around the stations to be identified. The data also allows firms' industry sectors to be identified, thereby determining if certain sectors are attracted to move to or from station areas.

5.15 Two separate approaches were used with the firm data to assess the impacts. These are set out in Table 5.2. The first approach looks at how aggregate firm performance has changed over time, comparing areas around HS1 stations to non-HS1 stations.

5.16 The second measure looked at how firm performance and population compares to that of firms around regular stations *now* (or at a point in time with HS1 fully established), when compared to before HS1 was operational. This included looking at the outputs relative to their proximity via the inner ring and outer ring around stations,[8] where the outer ring relates to a distance from 1.5 km to 5 km around stations. This differs from the radii used for the descriptive analysis, which was assessing station users, who are a different cohort to businesses. To assess business population with sufficient samples sizes, a wider radius is needed.

[8] The inner ring is defined by a 1.5 km radius and the outer ring from 1.5 km to 5 km

5.17 Firm performance and population refer to the firm outputs from the IDBR that we measure, specifically turnover and employment (performance) as well as outright numbers of firms or firm branches in the locality, including by sector. This allowed an assessment of how firms or sectors of firms might be attracted to locate close to or around stations.

Table 5.2: Summary of Phase 2 Analysis: Assessing impact of HS1 on firms locating around stations

Description of Approach	Unit of analysis	Time Period Measured	Method/Comparators
Phase 2a. Change in performance and population of firms near an HS1 Station (inner ring – up to 1.5 km) relative to non-HS1 peers.	**Catchment area around a station**	Measuring performance over time, starting from pre-intervention (2003-2008) to post intervention (2009-2019) period.	Synthetic Controls, with synthetic comparators from firms around non-HS1 stations in South East England.
Phase 2b. Outright performance and population of firms in inner and outer ring (1.5 km up to 5 km) relative to non-HS1 firms.	**Firm located near a station**	Comparing pre-intervention (2007 and 2008) to post intervention (2018 and 2019)	Propensity Score Matching, comparing average performance of firms around non-HS1 stations in South East England.

Source: Cambridge Econometrics

5.18 A technical note at Appendix D provides details and descriptions of the econometric methods used for the analysis, as well as full results of the tests used. It is important to note the difference between the two methods: Phase 2a was designed to capture the effects of HS1 over time, on the entire area around an HS1 station. On the other hand, phase 2b sought to capture its effect on individual firms near an HS1-served in the latest two years with years with data (2018-19).

Treatment 'dosage'

5.19 A key consideration of this analysis concerns the 'dosage' of treatment that each area receives. Dosage relates to the level of connectivity enhancement that is delivered by the HS1 high-speed domestic services, measured in this case by connectivity to and from London. The level of dosage – connectivity enhancement – is very variable across the different towns in Kent that have benefitted from HS1 domestic services.

5.20 It is therefore important to consider the effects of the treatment in the context of the level of dosage. Similarly, the level of dosage relative to the existing service will also be an important consideration. That is to say, what is the existing level of service relative to the HS1 service? If existing connectivity is already good, how does this affect the impact of further connectivity improvements (dosage) introduced by HS1? Conversely, what will the impacts be where the dosage results in a substantial connectivity enhancement relative to the non HS1 service?

5.21 For this analysis, dosage is measured by the reduction in journey time or in generalised journey time (incorporating frequency of service) offered by the HS1 domestic service versus the non-HS1 service. Dosage is included in the propensity score matching (phase 2b) but not in the synthetic controls (phases 1 and 2a)

Phase 1 results and analysis

5.22 Summarised in Table 5.3 is the treatment effect on each of the analysed outputs of GDP, population, and house prices in each of the treatment authorities measured. The results are

categorised as either a strong or minor positive effect, no effect, or a negative effect. The results are all in relation to their synthetic comparators only, so a negative effect only means that an area was outperformed by its synthetic comparator. Output measures are considered for the post-intervention period, whereas matching variables are only considered during the pre-intervention period.

Table 5.3: Local Authority Districts: Summary of Treatment Effects

Output Measure	Matching Variables	Strong Positive Effect Detected	Minor Positive Effect Detected	No Effect Detected	Negative Effect Detected
GDP	• GDP • Employment • London GJT • Job density • Productivity		Gravesham, Thanet	Ashford, Dartford	Canterbury, Dover, Maidstone, Medway, Swale
Population	• Population and Population Change • Rurality • London GJT • Job density	Ashford, Canterbury, Dartford, Swale, Maidstone	Gravesham, Thanet, Dover		Medway
House Prices	• House Prices • Population Change • Rurality • London GJT • Job density	Canterbury, Dartford, Gravesham, Medway	Dover	Ashford, Maidstone, Thanet, Swale	

Source: Cambridge Econometrics analysis

Population

5.23 The analysis shows that much of the most significant positive effects occur in the population metric. Here, all the districts considered bar one show population growth over and above their synthetic comparators. Furthermore, there is an acceleration in the divergence from the comparators after 2009 when HS1 services were introduced. The result of the synthetic control test for Ashford is shown at Figure 5.2. Here, population growth, while already ahead of the synthetic control group in 2006, begins to accelerate from 2012.

5.24 The one outlier is Medway, which has not displayed the same level of population growth as the other HS1-served districts or the synthetic comparators. This result is further confirmed by the absolute numbers which show that between 2003 and 2018, Medway's population grew by around 10% compared with between 18% and 22% for Canterbury, Swale, Ashford and Maidstone.

5.25 Good connectivity to London is one of a number of reasons people may be attracted to live in the Kent districts, however the econometric tests indicate that the introduction of HS1 services has been a factor in boosting the resident population growth in all but one of the districts analysed.

5.26 Naturally, it is not possible to control the extent of the impacts of HS1, nor the precise timing of those impacts. Numerous factors may be at play that affect the time between treatment and observed impact. For example, it is known that the 2008 financial crisis and resultant recession affected the housing market in the years immediately afterwards, and caused

significant economic disruption, which may have suppressed the impacts that might be expected sooner following treatment.

5.27 Furthermore, while the HS1 service can contribute to an increase in demand for homes and therefore population, there is also the issue of housing supply. Regardless of the amount of demand generated, this will not lead to increased population unless new homes are built. Therefore, the supply of homes will also be a key influencing factor in population growth and is likely to play a part in the variations in population growth and house prices observed in these results.

House Prices

5.28 Related to residential population growth is housing price growth. This was assessed to see if there is evidence that the introduction of HS1 services has had a particular impact on property values in the districts served. Here there was evidence of an effect in five of the districts observed, while no effect was found in four.

5.29 It is important to reiterate that house price inflation was still evident in all districts, but in Canterbury, Dartford, Gravesham and Medway, and to a lesser extent Dover, there was evidence that HS1 may have further increased values relative to their comparators. The result for Canterbury is shown in Figure 5.3 from which it can be seen that prices broadly tracked the comparator until 2010, after which, following the disruption resulting from the Global Financial Crisis, values begin to rise notably faster than the control group.

5.30 As is mentioned in paragraph 5.27, housing supply will also be an influencing factor in house prices. For example, analysis of housing stock shows that the lowest number of homes built between 2009 and 2018 was in Gravesham (1,954), which would suggest that house prices there will be more sensitive to a positive demand stimulus (such as HS1).

5.31 Conversely, the highest number of homes built in this period was in Maidstone, where the test result for house price growth for the district was in line with its non-HS1 comparator, thereby suggesting no additional house price effect as a result of HS1, albeit house price growth remained significant.[9] It should also be noted that the 'dosage' level in Maidstone is low as a result of limited daily services from Maidstone, making it harder to discern an impact.

Local GDP

5.32 It should be noted that because impacts are being assessed within local areas, GDP is measured at the district level. Therefore, the earnings of those who leave the district to work (or whose earnings are registered to companies outside the district) will count towards the GDP of the workplace, not the residential district.

5.33 A clear feature in the results for this part of the analysis is the lack of impact detected for local GDP and, in a number of cases, evidence of a negative impact on GDP. That is to say, some areas have seen GDP growth fall behind their comparators since the introduction of HS1 services. An example of this is Maidstone (Figure 5.6) and similar effects are observed in Canterbury, Medway, Swale and Dover.

5.34 Overall, these areas correspond with high levels of demand and user growth in HS1 stations (see Table 5.4). Rochester in Medway experienced 118% user growth between 2008 and 2015,

[9] Maidstone synthetic comparator: average price rise from £244,000 to £305,000 (ten years to 2018) Maidstone: average price rise from £215,000 to £312,000.

Deal in Dover experienced 79% growth and Maidstone West 29% growth, in one of the larger stations for user numbers (approximately 450,000 users a year in 2015).

5.35 Economic theory indicates that economic impacts are influenced by local leakages, of which commuting is one. Shields and Deller (1998) state that, "*when dealing with small, open economies, one obvious source of economic leakage is the loss of locally generated earnings via commuting".*[10]

5.36 Similarly, the growth in users of HS1 stations (as set out in Chapter 4) indicates leakage from HS1 districts, in response to job opportunities in London. This may be balanced by commuters coming into the areas to work, while the losses of locally generated earnings from HS1 districts may be negated if they are derived from new residents moving into the area.

5.37 To determine definitively the extent of the GDP effect of workers commuting into and out of the HS1 districts, further detailed studies of commuting, migration and demographic data would be needed. What can be determined from available data is that the level of out-commuting from the HS1 stations has been greater than the level of in-commuting over the study period.

5.38 We can also obtain an indication of inward migration of workers locating in HS1 districts through the change in numbers of working-age people. In Maidstone, for example, numbers of working age people grew by around 7,000 in the decade after HS1 services were introduced, and by around 5,000 in Ashford.[11] This rate of growth of working-age people, while sizeable, is not sufficient to account for all the growth in passenger numbers. This means a substantial amount of the passenger growth will have come from existing local population, thus resulting in the aforementioned leakage of locally generated earnings (and local GDP).

5.39 What this initial analysis suggests is that the leakage of local earnings resulting from out-commuting (and growth in out-commuting) over the study period is likely to be a factor in the relative underperformance of local GDP identified in the results. In this instance, local GDP would be improved if more, and higher quality, employment opportunities were created and had the effect of encouraging more people to work locally.

5.40 As it is, the economic incentive for Kent residents to seek higher wages in London is evident in the wage differential between the two workplaces. Kent residents earn on average 45% more by working in inner London, compared to those in both Hertfordshire and Surrey, where the difference is around 25%, or Bracknell Forest, whose residents earn just 8% less by working locally compared to inner London.[12]

Examples of results

5.41 The graphs at Figure 5.2: to Figure 5.6: show examples of the synthetic control tests for a selection of LADs and output metrics as follows: Ashford population (strong effect), Canterbury house prices (strong effect), Thanet GDP (minor effect), Ashford GDP (no effect)

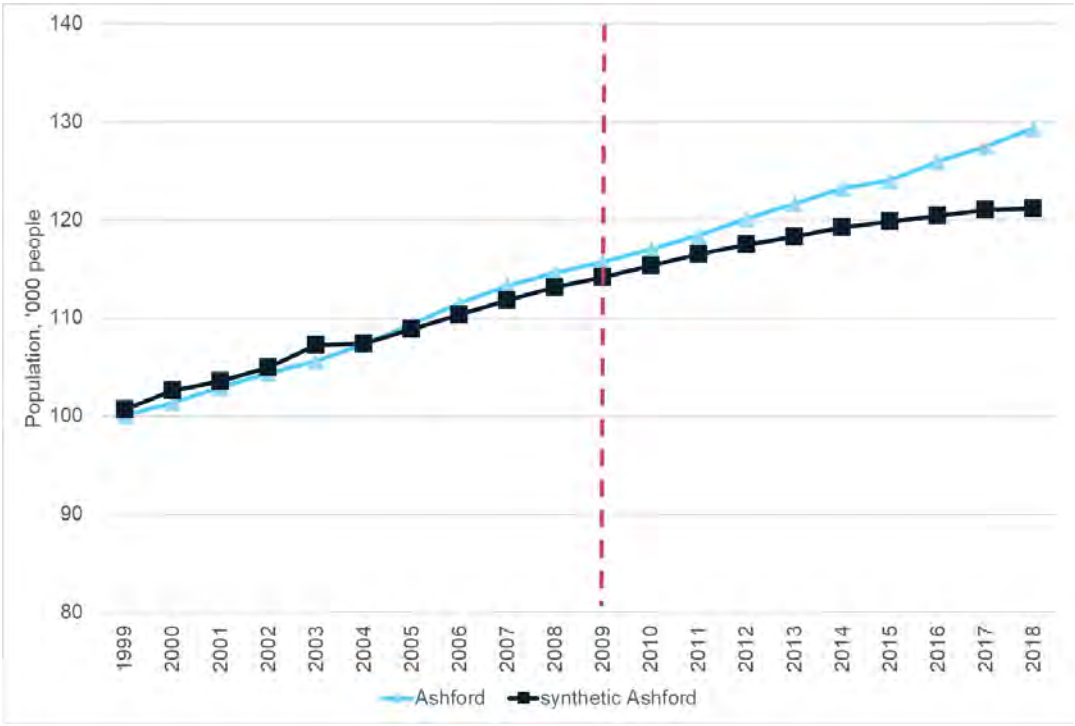
[10] Shields.M. and Deller.S. (1998), Commuting's Effect on Local Retail Market Performance, *Review of Regional Studies,* Scholastica, Chicago

[11] ONS Mid-year population estimates, via Nomis

[12] ONS ASHE Survey data based on weekly workplace earnings of: Inner London £838, Kent £575, Herts £663, Surrey £664, Bracknell Forest £775

and Maidstone GDP (negative effect). The complete set of the Synthetic Control results can be seen in the Technical Note which forms Appendix D.

Figure 5.2: Econometrics synthetic control test result: Ashford Population

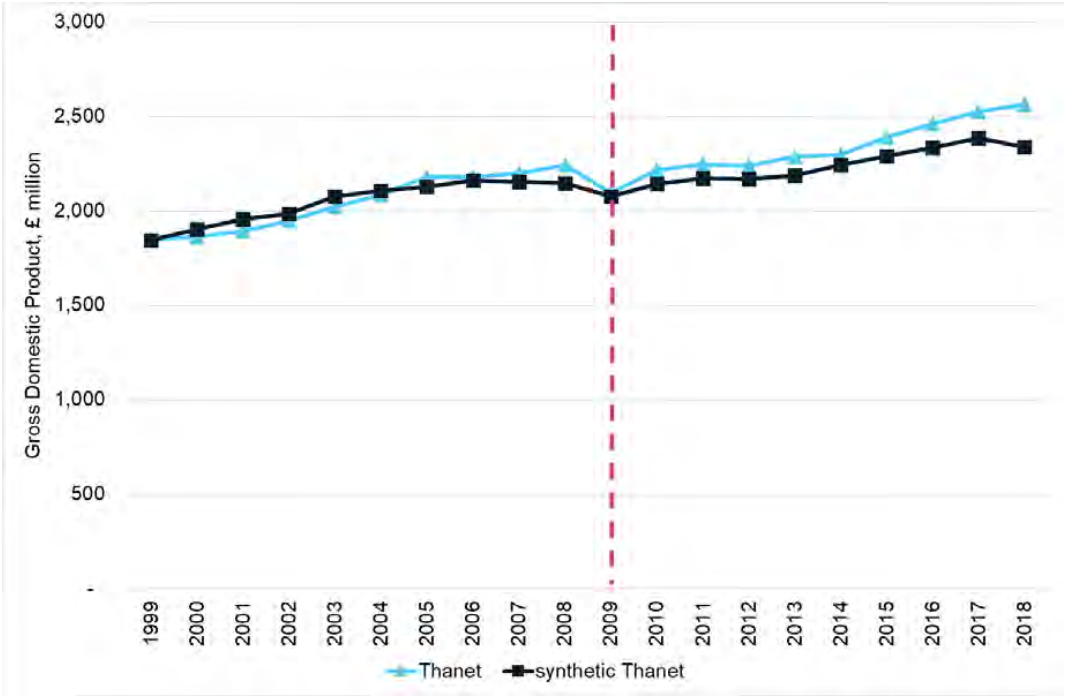


Source: Cambridge Econometrics analysis

Figure 5.3: Econometrics synthetic control test result: Canterbury House Prices

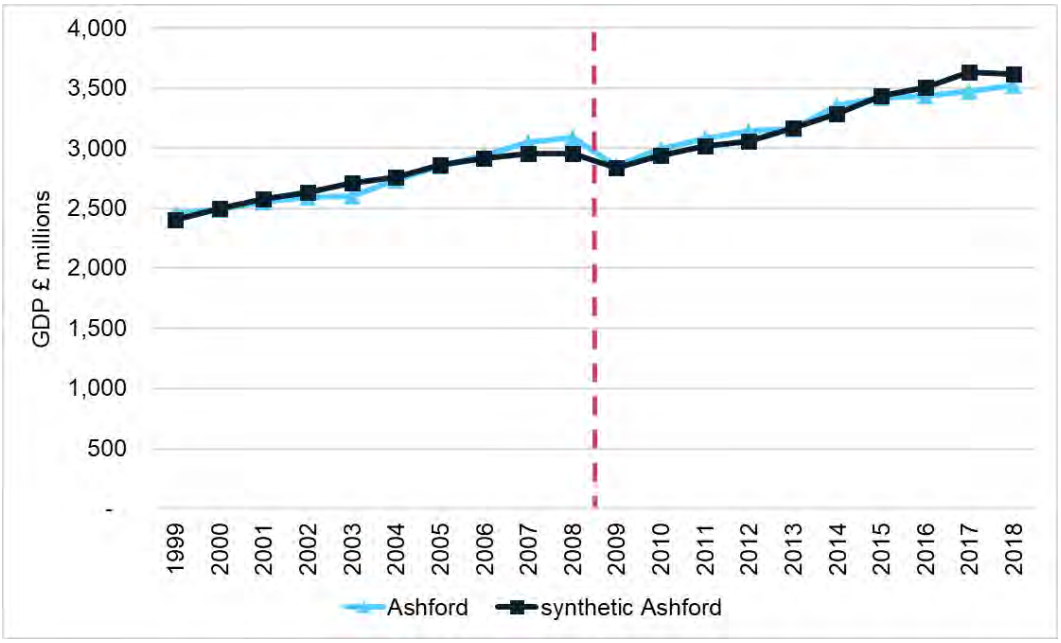
Source: Cambridge Econometrics analysis

Figure 5.4: Econometrics synthetic control test result: Thanet GDP



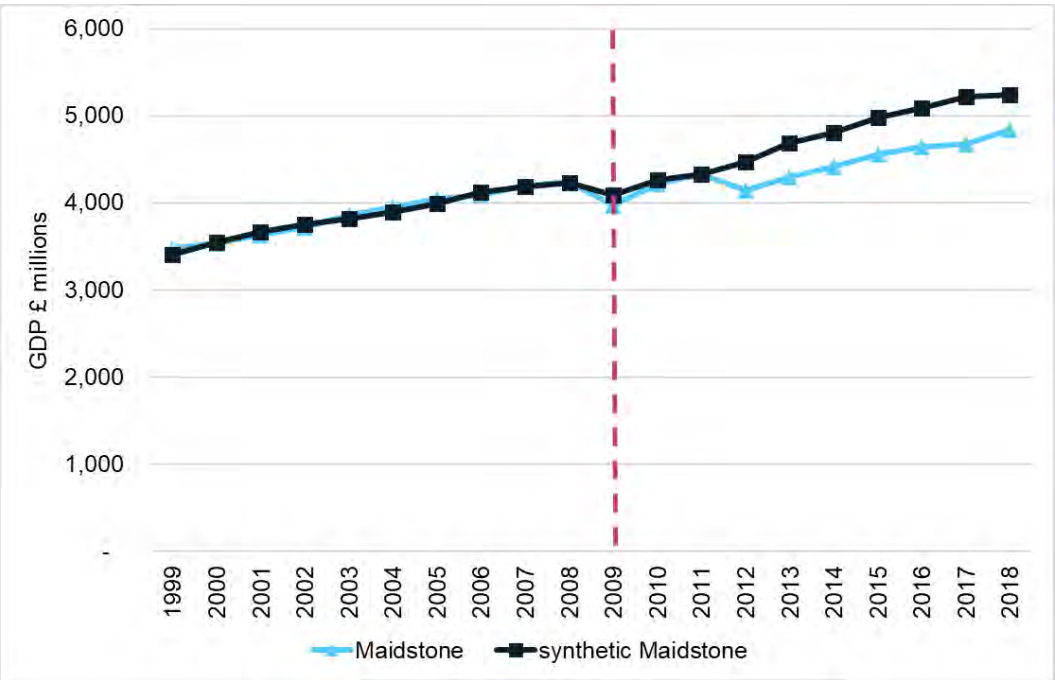
Note: Gross Domestic Product (GDP) chained volume measures (CVM) (2018 prices)
Source: Cambridge Econometrics analysis

Figure 5.5: Econometrics synthetic control test result: Ashford GDP



Note: Gross Domestic Product (GDP) chained volume measures (CVM) (2018 prices)
Source: Cambridge Econometrics analysis

Figure 5.6: Econometrics synthetic control test result: Maidstone GDP



Note: Gross Domestic Product (GDP) chained volume measures (CVM) (2018 prices)
Source: Cambridge Econometrics analysis

Summary of effects

5.42 Listed in Table 5.4 are each LAD in alphabetical order along with a summary of the effects observed in each. In addition, the table shows dosage level in GJT and in JT reductions relative to pre-HS1 services. In the last two columns to the right of the table, the increase in users before and after the introduction of HS1 services is shown, followed by a comparison between the ticket prices of HS1 and non-HS1 services.

5.43 Each of these factors – dosage, demand and prices – are likely to influence the treatment effects that are observed.

Table 5.4: Overview of Treatment Effects and Dosage level by Local Authority District

LA District (Station)	Effects Observed	Dosage: Max. GJT* Reduction	Dosage: Min. JT* HS1/Non-HS1	Demand: % chg in users 2008-2015	Fares: (£) Off-peak, HS1/Non-HS1
Ashford	• High Population Effect • No House Price Effect • No GDP Effect	32%	38 / 80	29%	36.50 / 30.40
Canterbury	• High Population Effect • High House Price Effect • Negative GDP Effect	23%	54 / 89	75.2%	37.10 / 30.60
Dartford (HS1 = Ebbsfleet Non-HS1=Dartford)	• High Population Effect • High House Price Effect • No GDP Effect	N/A	18 / 35	315%	20.00 / 11.00
Dover (Dover Priory)	• Some Population Effect • Some House Price Effect • Negative GDP Effect	21%	65 / 104	11%	37.00 / 30.10
Dover (Deal)	• Some Population Effect • Some House Price Effect • Negative GDP Effect	16.7%	84 / 142	79.4%	37.00 / 16.10
Gravesham (Gravesend)	• Some Population Effect • High House Price Effect • Some GDP Effect	26%	22 / 55	-3.9%	20.00 / 14.90
Maidstone (Maidstone West)	• High Population Effect • No House Price Effect • Negative GDP Effect	N/A (up to 37% JT)	53 / 65	29.2%	24.30 / 21.60
Medway (Strood)	• No Population Effect • Some House Price Effect • Negative GDP Effect	24%	33 / 52	21.3%	23.30 / 18.80
Medway (Rochester)	• No Population Effect • Some House Price Effect • Negative GDP Effect	14.9%	37 / 43	118.3%	25.50 / 21.00
Swale (Sittingbourne)	• High Population Effect • No House Price Effect • Negative GDP Effect	6%	55 / 60	7.9%	18.40 / 14.30

LA District (Station)	Effects Observed	Dosage: Max. GJT* Reduction	Dosage: Min. JT* HS1/Non-HS1	Demand: % chg in users 2008-2015	Fares: (£) Off-peak, HS1/Non-HS1
Thanet (Ramsgate)	• Some Population Effect • No House Price Effect • Some GDP Effect	18%	74 / 106	38.7%	37.10 / 30.10
Thanet (Margate)	• Some Population Effect • No House Price Effect • Some GDP Effect	9%	86 / 103	31.1%	37.60 / 27.60

Source: Dosage Data and Demand Data from Department for Transport

Observations for positive GDP effects

5.44 It is worth considering the areas that showed some positive GDP effects and what the drivers for this might be. The two areas showing some positive GDP effects are Gravesham and Thanet.

5.45 In Thanet, issues in term of wages and high-end employment are evident, as is the minor population growth. While station user demand has increased in Thanet, this is from a much lower level and may also reflect growth in leisure travel, as noted in Chapter 4 (paragraph 4.29) Ramsgate station had a little over a sixth of the demand of Gravesham station for example,[13] following a rise in demand of around 39% post-HS1. It is also relevant that Thanet is much further from London with journey times well over an hour post-HS1, which will be considered too much for many potential commuters.

5.46 None of these effects appear significant enough to result in an amount of new commuting into London sufficient to cause a corresponding drag on local GDP growth. The opportunity in both these districts, is for local policy makers to generate local growth in the relative absence of a strong London effect, allowing workers and activity to be retained and focussed locally.

5.47 It is also worth noting results in Ashford. Here, with a high level of dosage, the population results are high, with the result that demand growth, while significant at 30%, is not as high as the stations in districts with negative GDP effects. This suggests a slightly better growth balance in the district, where the local population has grown but has been less strongly driven by the commuter effect, perhaps allowing for more local GDP growth and development, as indicated by the neutral GDP result in the district.

Phase 2 results and analysis

Phase 2a: Analysis of firm performance over time vs comparators

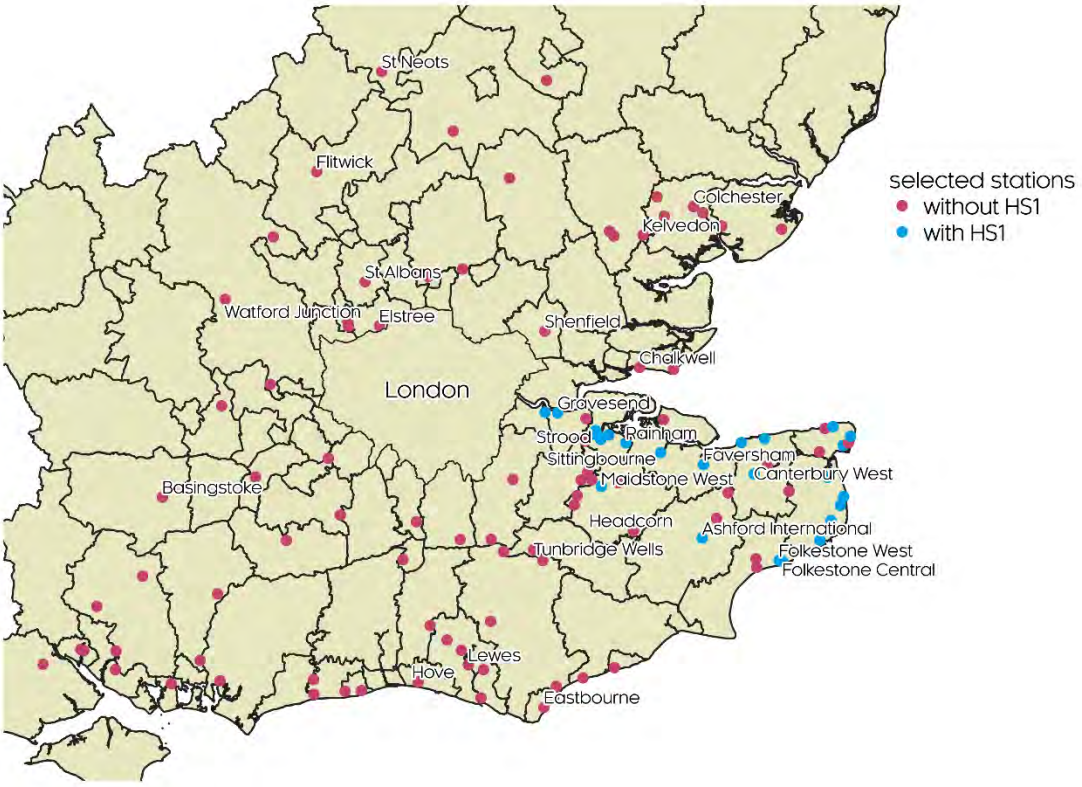
5.48 As set out in the introduction to this chapter and in Table 5.2, the second phase of analysis tests the hypothesis that HS1 has had a positive impact for the areas surrounding stations, making them more attractive for businesses to set up there. This involved analysing detailed firm-level data obtained from the ONS IDBR. The immediate surrounding area is defined as a

[13] Demand at Ramsgate station 2015, approx. 156,500 vs approx. 989,500 at Gravesham. Source: DfT Data

1.5 km wide ring around each station. The outcomes checked in each ring are turnover, employment, productivity, [14] the number of businesses and the number of young enterprises.

5.49 First, a synthetic control analysis was used to compare treated areas with comparator areas over time, based on the pre-intervention period (2003-2008) and the post-intervention period (2009-2019). These are chosen by being at a similar distance from central London to the treated stations, and by having good data availability. The comparator areas are shown in the map at Figure 5.7 below.

Figure 5.7: HS1 'Treatment' Stations and non-HS1 Comparator Stations



Source: Cambridge Econometrics

5.50 As with the district level analysis, comparisons with synthetic controls are a means of identifying if the treatment (in this case the introduction of HS1 services at stations) had an effect on the observed metrics, over and above trends seen around the control stations.

5.51 The effect is assessed relative to the comparator area and is described as positive, neutral or negative in relation to it. It is important to note that a positive or negative effect does not necessarily mean the metric, such as the number of businesses, grew or reduced in absolute terms. It only means that its rate of growth was more or less than that of the comparator. If the result is neutral for example, this indicates the treatment is unlikely to have had a significant effect on the observed metric because the same or similar outcome has been identified in the comparator area without the treatment. A negative result means that the comparator area outperformed the treatment area while a positive result means the treatment area outperformed the comparator.

[14] Productivity defined as turnover divided by employment

5.52 It is important to note that the synthetic controls metrics are matched with the treatment area metrics over the pre-intervention period. The objective is to achieve as close a match as possible in the pre-intervention period. It is then possible to observe any divergence in the output metrics in the post-intervention period, between the treatment area and the non-treatment area. The matching process is described in more detail in the Appendix D including example graphs showing how the matching of treatment areas and comparators was achieved.

5.53 The results are varied and show a range of positive, negative and neutral results. The majority of results are neutral. This is perhaps to be expected for two key reasons. Firstly, in order to be comparable to Kent's towns, the comparators are taken from generally similar and prosperous Home County towns around London which benefit from being part of the Capital's broad economic geography. All of these areas, including parts of Kent, have benefited to some degree or other from the economic strength of London. The results of the analysis show to what extent the HS1-served towns have benefitted relative to other comparable towns. For a HS1-served town to show a greater level of impact than its comparators that could be attributable to HS1, it must 'outperform' its comparators in the tested metrics.

5.54 Secondly, businesses are likely to be attracted to locate around stations offering good connectivity to London, or high footfall, regardless of whether they are served by HS1 or not. While HS1 has improved connectivity in the treatment areas, there are many other places in the South East with good rail connectivity to London. As such, while HS1 towns have experienced connectivity enhancements compared to their comparator towns, it cannot be assumed that that this improvement will be significant relative to what went before. However, there are some notable effects observable in the results, reflecting the referred to variations.

5.55 A clear trend of positive firm-level impacts that may be attributable to HS1 can be seen in Medway and north Kent, in areas closest to London, with Rochester, Gillingham, Ebbsfleet, and Gravesend featuring most consistently. That these areas are close to each other would also indicate the potential for agglomeration benefits playing a part in the positive results.

5.56 The outputs where most positive results were observed were for numbers of young enterprises. Eight HS1 towns have seen a positive impact across the intervention period for young enterprise creation, including Maidstone and Folkestone as well as many of the north Kent HS1 towns mentioned previously. Overall business numbers in Ebbsfleet, Gillingham, Gravesend, Rochester and Strood have also outperformed comparators.

5.57 For the negative results, Ashford features as having underperformed its comparators most in the outputs for numbers of businesses, employment, and numbers of young enterprises.

5.58 A complete table of change in firm performance over the intervention period, of HS1 stations and all comparator stations, can be found in Appendix D. Here it is noted that Maidstone West, Chatham and Strood proved to be problematic in terms of matching with synthetic control comparators. As such, the results for these three stations should be treated with caution. While Gillingham has a lower proportion of knowledge-intensive businesses (KIBs) than its controls, it is well matched across other variables.

Table 5.5: Summary Results of Station Area Synthetic Control Tests on Firm Outputs vs Comparators

Output	Matching variables	Impact detected
Number of businesses	• Number of businesses • Proportion of knowledge-intensive businesses (KIBs) • Area turnover • Area productivity • GJT to central London	• Positive in Ebbsfleet, Gillingham, Gravesend, Rochester, Strood • Negative in Ashford, Dover Priory and Faversham
Turnover in the area	• Area turnover • Proportion of KIBs • Area productivity • GJT to central London	• Positive in Chatham, Gillingham, Rochester, Walmer
Employment in the area	• Area employment • Area turnover • Proportion of KIBs • Area productivity • GJT to central London	• Positive in Folkestone West, Gillingham, Rochester • Negative in Ashford, Ebbsfleet
Area productivity	• Area productivity • Number of businesses • Area turnover • Proportion of KIBs • GJT to central London	• Positive in Ebbsfleet, Martins Mill, Ramsgate • Negative in Folkestone Central, Gravesend
Young enterprises	• Young enterprises • Area productivity • Number of businesses • Proportion of KIBs • GJT to central London	• Positive in Chatham, Ebbsfleet, Gillingham, Gravesend, Rochester, Maidstone, Strood, Folkestone Central • Negative in Ashford, Canterbury, Martin Mill, Herne Bay and Faversham

Note: Maidstone West, Chatham and Strood had a larger turnover and higher employment than their comparators to start with (See Appendix D). Therefore, results for these stations should be interpreted with caution.
Source: Cambridge Econometrics analysis

Phase 2b: Analysis of outright firm performance vs comparators

5.59 For this analysis, firm performance in the most recent years with good data (2018 and 2019, averaged) is compared with performance before the intervention (2007 and 2008, averaged). This difference is then compared with the difference between HS1 and non-HS1 locations (i.e. difference-in-difference). The same analysis is done at a more detailed spatial level (i.e. between the inner and outer ring of a station).

5.60 This was used to identify whether proximity to an HS1 station is more or less beneficial than proximity to a non-HS1 rail station. This includes an analysis of sectors to see if particular sectors are attracted to HS1 stations. An overview of the results is shown in Table 5.6. The columns including the label “estimate” show the *per firm* difference in performance of HS1 firms versus the comparators.

Table 5.6 Firm level impact of HS1 Estimated for period 2007/8-2018/9: Difference-in-Difference with Propensity Score Matching Results

	Employment per local unit	Turnover per enterprise (£000s)	Turnover per job (£000s)	Sample size
a. Impact on inner-ring vs outer ring around an HS1 station	-0.8	-114***	-5.2	100,402 to 100,522
b. Impact on firms near an HS1 station vs non-HS1 comparators	0.2	-25	2.2	664,914 to 666,885
• Construction	-0.04	18	2.1	97,577 to 97,585
• Logistics	-1.0	126	17.2	18,398
• Retail	0.6	73	2.1	61,635
• Hospitality	-0.4	-6	2.3	42,257
• Knowledge-intensive businesses (KIBs)	-0.3	-144	-6.7	136,503 to 138,412

Notes: *** estimate is significant at a 95% confidence interval (1.96 times the standard deviation)
Turnover and turnover per employment are defined at enterprise level; employment at the local unit level.
Outcomes estimated for 2018/9, with the pre-intervention period defined as 2007/8Sample includes the area around 23 stations served by HS1 and 84 other stations at a similar distance from London.
Knowledge-Intensive businesses include finance, real estate, accounting, legal and other professional services
Hospitality: food and accommodation services
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

5.61 The results for analysis 'a' (first row of Table 5.6) show that the average turnover of firms with local units in the inner ring of an HS1 station catchment experienced a less positive change over the study period when compared to the outer ring. This could be because:

- existing firms with local units in the inner ring experienced a relatively larger decrease in turnover compared to firms with local units in the outer ring over the time period
- existing firms with local units in the inner ring experienced a relatively smaller increase in turnover compared to firms with local units in the outer ring over the time period
- a higher proportion of smaller, low-turnover firms entered the market or opened local units in the inner ring than in the outer ring over the time period, lowering the overall average turnover.

5.62 No significant effect is detected for employment and productivity (as indicated by no asterisks against the numbers shown in that row).

5.63 The results for analysis 'b' (second row of Table 5.6) show that local unit performance does not differ significantly when located near an HS1 station compared to a non-HS1 station (as indicated by no asterisks against the numbers shown in that row). The comparators were controlled for variables of distance to London, enterprise sector, age, and distance from the station.

5.64 Looking at firms by individual sector (rows 3 to 7 of the table), they do not differ significantly when located near an HS1 station compared to a non-HS1 station.

5.65 To test the impact on firms located specifically within the outer ring, the area between 1.5 km and 5 km from the station was isolated, with the results shown in Table 5.7.

Table 5.7: Firm level impact of HS1 (outer ring) 2007/8 – 2018/9: Difference in difference with Propensity Score Matching Results

	Employment per local unit	Turnover per enterprise (£000s)	Turnover per job (£000s)	Sample size
Impact on firms near an HS1 station (outer ring)	0.7***	26	1.9	477,261 to 478,924
Construction	0.3	55	-2.1	74,233 to 74,236
Retail	0.9	129	-5.3	40,142
Knowledge-intensive businesses (KIBs)	0.3	-60	-4.9	97.838 to 99,453

Notes: *** estimate is significant at a 95% confidence interval
Turnover and turnover per employment are defined at enterprise level; employment at the local unit level.
Outcomes estimated for 2018/9, with the pre-intervention period defined as 2007/8
Sample includes the area around 23 stations served by HS1 and 84 other stations at a similar distance from London.
Knowledge-Intensive businesses include finance, real estate, accounting, legal and other professional services
Source: Inter-Departmental Business Register; Cambridge Econometrics analysis

5.66 These results show a significant positive change in economy-wide employment per local unit (asterisks shown). There are no statistically significant results for other indicators or for individual sectors. The increase in employment per local unit in the outer ring of HS1 stations (1.5 to 5km) could correspond to:

- existing local units near HS1 stations experienced a relatively larger increase in employment compared to local units near non-HS1 stations over the time period
- existing local units near HS1 stations experienced a relatively smaller decrease in employment compared to local units near non-HS1 stations over the time period
- a higher proportion of smaller, low-employment local units firms entered the market near non-HS1 stations compared to HS1 stations over the time period, lowering the overall average employment.

Phase 2 observations

5.67 What is apparent from the firm performance analysis is that some of the HS1-served towns are not able to perform as well as the comparators, despite the various control methods used to select those that were statistically similar throughout the pre-intervention period. This is likely to be a reflection of the high performing economic areas around and among some of the comparator stations that mean they retain a competitive advantage over the HS1 towns, despite the connectivity enhancements HS1 has offered.

5.68 Kent's HS1-served towns and Kent in general do not have the particular regional strengths and competitive advantages that have developed through the establishment of science and technology clusters in areas in Surrey, Hertfordshire and the Thames Valley for example, particularly in the post intervention period. The decade since 2009 marked a time of notable economic growth across the South East and notably in areas such as the Thames Valley and

south Hertfordshire. This is evidenced, for example, by the growth in the proportion of science and technology jobs which is generally double that of Kent.[15]

5.69 This means that the sub-regional economies, even of comparator areas that are outside these clusters, remain part of their economic geography and benefit accordingly, such as Basingstoke in respect of the Thames Valley, or Watford and St Albans which have become regional business locations in their own right. A full table of the comparator areas is provided in Appendix D.

5.70 However, it is also apparent that in the north Kent locations (Dartford, Gravesham and Medway), measures of firm level data indicate performance improvement over time, since the introduction of HS1, both in absolute terms and relative to their comparators. These outcomes are further supported by observational analysis of simple business population numbers since the introduction of HS1, shown in Table 5.8.

Table 5.8: Summary of Business Population Growth 2010-2019

	Total Business Units 2010	Total Business Units 2019	% Growth 2010-2019
Basingstoke and Deane	6,230	7,905	26.9%
Reigate and Banstead	5,605	7,260	29.5%
Ashford	5,035	6,445	28.0%
Canterbury	4,420	5,265	19.1%
Dartford	2,830	4,450	57.2%
Gravesham	2,630	3,910	48.7%
Maidstone	6,135	7,490	22.1%
Medway	6,235	8,515	36.6%
KENT	49,820	62,920	26.3%
SOUTH EAST	330,375	414,975	25.6%
GREAT BRITAIN	2,031,845	2,643,875	30.1%

Source: ONS Inter-Departmental Business Register

5.71 This data, while relating to district areas, provides an indication as to how the north Kent HS1-served towns (Dartford, Gravesham, Medway), outperformed comparator areas for business growth such as the examples districts of Basingstoke and Reigate. The data shows a level of business population growth in north Kent considerably above both the county, regional and national average. Conversely, growth in the number of firms in Ashford, Canterbury and Maidstone is only broadly in line with the regional or county averages and well below the national average. This would point to the likelihood of agglomeration benefits for businesses in the north Kent HS1 towns that are all close to each other, while the other towns are comparatively isolated.

5.72 While it may not be possible to directly attribute this growth to HS1 high-speed domestic services alone, what is clear is that the area has clearly become an attractive business location since the introduction of HS1 services. What is most likely is that the combination of business

[15] ONS BRES Data 2020 - Employment in M Class Occupations: Surrey 11.3%; Herts 12.2%; Thames Valley Berkshire LEP 12%; Kent 6.6%

benefits offered, such as access to the Capital and to adjacent towns and markets, access to multiple labour markets, infrastructure improvements and upgrades, will have all played a part in making the area more attractive as a business location, including for new businesses as the results for young enterprise creation also show.

5.73 Ebbsfleet in particular represents an interesting case study because it is a new station where there was no station before. Therefore, the local effects of the new high-speed connection to London can be more clearly observed relative to what existed before. The results in the test of introducing the service at Ebbsfleet include, for example, a 105% increase in the business count, a 131% increase in the count of knowledge intensive businesses, and a 171% increase in total business turnover around the station.[16] Of course, this growth rate is highest among the HS1 stations, because it begins from a low base. Nevertheless, it is a clear demonstration of the business impact of introducing a new service where there was none previously.

Conclusions from econometric analysis

5.74 The results of the econometric analysis are shown to be highly varied and wide ranging. This is perhaps to be expected when assessing a treatment that itself provides a wide range of intervention rates across a wide geography of places, each with their own characteristics. Whilst it is therefore challenging to ascribe outcomes in any given location to the precise magnitude of intervention they experienced, the analysis described here identifies a range of plausible explanations for how such results could have come about. These help us to understand the contributing factors and the role that HS1 may have played.

5.75 For the district level results, the tests show suggest strongly that HS1 domestic services have played a significant role in growing the population in most of the districts served. All but one of those assessed are shown to have grown faster than their comparators since the introduction of the service. It is noted that the HS1 service represents a demand response in terms of additional population being encouraged to locate in an HS1 served district. For this effect to be fully realised a supply response is needed in terms of housing delivery.

5.76 Local housing supply issue is likely to be a key factor in the house price tests. House price inflation across the region affects the comparator areas. Nevertheless, over half of the HS1 districts tested registered a positive impact, growing faster than their comparators since the introduction of HS1 services.

5.77 Perhaps the most significant of the observed effects relates to local GDP and the role of the ‘commuting effect’, which is also shown to be a likely influencing factor in the firm level results. The observed GDP effects are likely to be a result of the well-documented economic ‘pull’ of London which sees high wage jobs draw workers from a large catchment area, which includes the home counties.

5.78 The described leakage effect of high levels of local out-commuting in many of the HS1 areas, where not balanced by in-commuting and high-value local employment, appears to place them at a clear disadvantage to their comparators in terms of local GDP performance. It should be noted that HS1 connects a global capital to towns within its catchment – areas that are not economically comparable. Enhancements that connect similarly sized regional centres to each other are likely to produce different results. If two areas are more comparable

[16] See Technical Note, Appendix D, Table D.7, for firm performance by individual station

economically, the relationship between them will generally be more balanced with a more even distribution of residential and workplace workers.

5.79 The HS1 services, while offering connectivity into and out of London, have seen the capital extend and strengthen its pull effect. To compete, local areas outside London need to establish significant sub-regional employment clusters of their own. This has been achieved in other areas around London which host hi-tech and knowledge firms, corporate headquarters and sector specialisms – as in St Albans, Watford and Bracknell Forest. The percentage of local jobs in professional, scientific and technical sectors in is 16% in Watford, 15.3% in Bracknell Forest and 10% in St Albans, compared with just 6.2% in both Ashford and Maidstone.[17]

5.80 In addition, different wage differentials between London and Kent compared with between London and these sub-regional clusters (described in paragraph 5.40 above), demonstrate the extent to which these clusters have been able to balance the pull effect of London jobs with more comparable wages. As is shown, in Kent we find a differential between local and inner London wages of 45%, compared to just 8% in Bracknell Forest of example. This means the financial incentive to work in London is much higher for Kent residents than Bracknell Forest residents, and that providing a quick and convenient means to access those jobs through HS1, adds a further, practical incentive.

5.81 The lack of regionally significant clusters in Kent is likely to be a contributing factor in the mixed firm results that show some underperformance relative to the comparator areas. Such clusters play a key role in attracting the high value firms and well-paid employment opportunities in areas like the Thames Valley that help to reduce the commuting incentive.

5.82 While HS1 services provide the same opportunities for people to commute *into*, as well as out of, HS1 towns, the economic incentives to do so are heavily weighted toward out-commuting to access higher quality knowledge sector jobs with higher wages.

5.83 The relatively strong firm performance in the Medway towns in the Phase 2 analysis demonstrates local development around HS1 towns that can support GDP growth and provide local opportunities, helping to balance local out-commuting.

5.84 Plans recently submitted by the Ebbsfleet Development Corporation, comprising 50 hectares of mixed and commercial space centred on the HS1 station at Ebbsfleet, also demonstrate commercial support and potential for major local development opportunities where HS1 services play a significant part.[18] It is noteworthy that over a decade since HS1 services were first introduced major commercial developments anchored around HS1 stations are still being planned. This shows how the necessary conditions for development to come forward can require even longer time periods to assess than that which has been available for this study.

[17] ONS Business Register and Employment Survey, 2020. Via Nomisweb.co.uk

[18] Outline planning application submitted for Ebbsfleet Central East – Ebbsfleet Development Corporation (ebbsfleetdc.org.uk)

6 Qualitative analysis

Introduction

6.1 Qualitative research was conducted with individuals from local government, businesses, and business representative groups. This research was used to explore perceptions of the impacts of HS1 and gather a narrative account of the barriers and enablers to achieving impacts.

Objectives of the qualitative research

6.2 The purpose of the qualitative research was:

- to obtain a deeper and more nuanced understanding of the mechanisms at play
- to understand individuals' perceptions of what has occurred, why and how
- to provide context to the quantitative findings
- to illustrate and investigate examples of the impacts being elicited by the quantitative research.

6.3 The objective of the research was not to achieve a representative sample of individuals or groups affected, but instead to target those who could add depth and breadth to the study's insights. The research was successful in achieving responses from a range of different types of interviewee, across different organisation types, sectors, and geographies. In collaboration with the client, we developed the following research questions:

Local context

- What have been the key impacts of HS1 on the local area?
- How have these impacts been shaped by local contexts (for example, how complementary activities of local authorities contributed to its impacts)?
- How and why have local social and economic impacts materialised in the way they have (and what has been the contribution of the local contexts described above)?
- Has the character of areas around stations along the line changed as a result of HS1 (for example, types of businesses, mix of residents, housing, use of public space)?

Local socioeconomic impacts

- What risks and opportunities has HS1 presented for businesses, and how have different sectors responded (including import, export, and foreign and domestic investment)?
- How is HS1 seen to have affected job opportunities in different areas along the lines (including barriers and enablers of access to jobs)?
- How have local transport providers been affected by, and responded to, HS1?
- How have transport users – including non-users of HS1 – been affected by, and responded to, HS1?

Local planning impacts

- How and why has HS1 influenced local authorities' development plans and activities?

- How have plans for the type and location of new housing developments been affected (including barriers and enablers experienced by those involved)?
- What were the barriers and enablers to wider development plans (including incentivisation of developers)?

Unexpected impacts or lack of impacts

- Where intended benefits of HS1 have not arisen, why has this been the case and what lessons can be learnt?

6.4 The research took the format of a series of focus groups and individual depth interviews. Interviews and facilitation were undertaken by specialists in qualitative research from Steer-ED, our Economic Development team.

Recruitment and interaction

Segmentation and engagement

6.5 In response to the research themes (and to obtain a breadth of views and impact types), qualitative research was conducted with three broad categories of organisation type: local government, business representative groups, and individual businesses from sectors identified as being most likely to have been affected, either positively or negatively, by the presence of HS1. Businesses from a range of different sectors were targeted, including the tourism/hospitality sector, knowledge-intensive businesses, local transport providers, housing developers and other firms in close proximity to stations.

6.6 Our approach to engagement was to make use of existing relationships with umbrella organisations held by ourselves and also by DfT. We initially reached out to individuals at Kent County Council and South East Local Enterprise Partnership (LEP) to make contact with individuals of interest. We also made a 'cold' approach to the Kent Chamber of Commerce, through which multiple other contacts were identified. Following this, we used a 'snowball sampling' approach – asking each interviewee to identify other groups, firms or individuals who may be able to contribute to the research. Interviews took place across July, August and September 2022.

6.7 Table 6.1 summarises the interviews and focus groups which took place, their type, the job title of the interviewee.

Table 6.1: Summary of interview and focus group participants

Category	Organisation	Engagement type	Date
Local government	Kent County Council	Depth Interview (2 participants)	27 July 2022
Local government	District Councils: Medway & Gravesham	Focus Group (2 participants[19])	4 August 2022
Local government	District Councils: Sevenoaks, Thanet, Ashford, Canterbury	Focus Group (4 participants)	8 August 2022
Local government	District Councils: Tunbridge Wells, Maidstone, Tonbridge & Malling	Focus Group (3 participants)	12 August 2022
Local government	Ebbsfleet Development Corporation	Depth Interview (1 participant)	14 September 2022
Business overarching group	Kent Invicta Chamber of Commerce	Depth Interview (1 participant)	24 May 2022
Business overarching group	Locate In Kent (Kent's inward investment agency)	Depth Interview (1 participant)	18 July 2022
Business overarching group	Visit Kent (Kent's tourism agency)	Depth Interview (1 participant)	20 July 2022
Business affected by HS1	Stafford Perkins (commercial property agent)	Depth Interview (1 participant)	22 July 2022
Business affected by HS1	Ashford Designer Outlet	Depth Interview (1 participant)	11 August 2022
Business affected by HS1	Stantec (professional services firm)	Depth Interview (1 participant)	9 September 2022
Business affected by HS1	Jasmin Vardimon Dance Company	Depth Interview (1 participant)	26 September 2022
Business affected by HS1	Stagecoach Bus	Depth Interview (1 participant)	24 August 2022
Business affected by HS1	Discovery Park (science park)	Depth Interview (1 participant)	31 August 2022

Source: Steer

Approach

6.8 We conducted both depth interviews and focus groups virtually, using Microsoft Teams video-conferencing software. Details of how these were undertaken are as follows:

- **One-to-one depth interviews** were used for individuals with a substantial amount to discuss, and whose views were unique amongst the group of study segments. For example, *Locate In Kent* (Kent's inward investment agency) was engaged via a depth interview rather than a focus group. Depth interviews each lasted approximately one-hour in duration, were semi-structured, and were conducted using a topic guide and interview protocol. Topic guides, which were tailored to the three different categories of interviewee, are available at Appendix E. They included questions around the perceived

[19] One invitee was unable to attend due to serving jury service during the interview period, which reduced attendance for this focus group to only two.

impacts of HS1 on businesses, land use and the local community. Business impacts were the major focus of interviews with businesses and business overarching groups, while local government interviews focused on community and land use impacts. A detailed note of each conversation was taken by the interviewer. To support development of these notes, interviews were also recorded, with prior written consent obtained from all interviewees, and confirmed again verbally at the commencement of each interview.

- **Focus groups** were used where a number of individuals and organisations could be brought together into a single conversation. Use of focus groups permitted a greater number of individuals to be consulted within the study budget and timescales. It also allowed individuals to share ideas with one another. Each focus group session lasted 1.5 hours. Again, sessions were recorded with prior written consent of participants, which was confirmed verbally at the start of the session.

Analysis

Local context

6.9 Interviewees described key geographic and economic features of the region. Sectors which interviewees raised in greatest detail, when asked which sectors had been particularly affected by HS1, were the tourism sector, the cultural and creative sector, and the professional services sector.

6.10 According to the tourism sector representative we spoke to, the tourism sector is a key industry for Kent. Kent's Heritage Coast was listed as one of the Lonely Planet's Top 10 regions to travel to in the world in 2022[20] (featuring amongst destinations in Iceland, Australia, and Japan). The region boasts heritage locations, historic attractions (such as Leeds Castle and Canterbury Cathedral), and seven major vineyards, with a growing reputation for sparkling wine production. Based on Visit Kent's estimates, there were 65 million tourist visits in 2019, the majority of which were day trips.

6.11 Notwithstanding the lack of regional strengths and competitive advantage in Kent compared to other areas of the South East, interviewees did point to some emerging opportunities: some areas of the region have developed arts, cultural and digital sector offerings, and a reputation for being young and creative places to visit and work. In particular, Margate and Folkestone were reported to have developed this reputation. Folkestone, described by one interviewee as 'Shoreditch on Sea', boasts a selection of independent shops, street-food pop-ups, music and events, including the Folkestone triennial arts festival and fringe. Meanwhile, Margate's Turner Contemporary Museum opened in 2011 and hosts internationally renowned contemporary art exhibitions.

6.12 Interviewees also mentioned manufacturing businesses located in Kent, and services businesses which support the local populations. Towards the north of the region, heavy industries such as cement and paper production were traditionally located along the banks of the River Thames. In the South, near to Sandwich, a large science park previously hosted 2,500 biosciences jobs for the pharmaceuticals company Pfizer. Interviewees explained that Pfizer withdrew from the area in 2011, but the science park remains and continues to host a large community of bioscience firms.

[20] https://www.lonelyplanet.com/best-in-travel/regions

Overview of impacts of HS1

6.13 The broad categories of impact caused by HS1 described by interviewees fell into the following four categories, which are described in further detail in the rest of this section:

- **Commuting** – HS1 permits individuals to live in Kent and work in London with ease. This has allowed existing Kent residents to work more easily in London (which brings higher salaries and wider opportunities), and also for those with London jobs to move into the area and benefit from a different lifestyle and lower property prices compared to equivalent properties in London.
- **Economic growth** –businesses have moved into the area (from both London and elsewhere), attracted by the relatively cheap land available workforce, and strategic location for national and international travel. HS1 is often cited as a contributor to the decision to move to Kent. Multiple interviewees cited the example of Brompton Bicycle, the British manufacturer of folding bicycles, which is developing plans to move its headquarters and manufacturing facilities out of London to a site in Ashford[21]. A well-informed interviewee told us that Brompton would not have considered the Ashford location without HS1.
- **Residential growth** – in response to economic and commuting growth, there has been significant residential housing development in some areas of Kent. This has been most notable in Ashford, with significant brownfield and greenfield sites on the periphery of the town being developed. Residential development has also occurred, to a lesser extent, in Ebbsfleet and other more rural areas (a new village development, Peters Village, near to Snodland station, was described by one interviewee).
- **Tourism** – multiple interviewees described the significant benefits to the tourism industry of the high-speed services. This includes increased day trips, overnight stays and tourism expenditure, particularly from tourists coming from London. Surveys conducted by Visit Kent support these assertions, with many tourism businesses agreeing that HS1 has had a positive impact on the sector, although their methodology was not independently verified.

6.14 These benefits vary across the region by sector and geography. Interviewees spoke unanimously of the success of Ashford, which has been the recipient of significant economic growth, population growth and new residential developments, although one did describe the retail offer in Ashford as 'in decline'. As noted in the trend and econometric analysis, while there has been population growth in Ashford, employment and GDP have not been as strong, perhaps in contrast to the message from the interviewees in the qualitative analysis. Tourism benefits, in contrast, have been felt by other parts of the region where there is an existing and prominent tourism offer – Canterbury, Folkestone and Thanet (Margate, Broadstairs and Ramsgate) were described as being key beneficiaries of tourism.

6.15 Areas to the north of Kent, in closer to proximity to London, were perceived to have experienced an increase in commuting more than any other effect (this aligns with the econometric findings). This was described as being due to their proximity to London, making commuting most feasible; but also the absence of a tourism offer, and a less clear rationale for businesses to relocate to these areas. Meanwhile Canterbury, described as being a very

[21] See, for example, this news article which reports details of the plans: **Brompton Bikes plans £100m wetland factory on stilts**

desirable location, was felt to have experienced both commuting effects and tourism benefits. Some areas, particularly those which have not experienced a significant journey time improvement, were described as having experienced only limited or marginal impacts from HS1. These include Maidstone, Tonbridge and Malling, and Tunbridge Wells.

6.16 The interviewees we spoke to were from a range of local government organisations, businesses, and business overarching groups. In general, their views of the impacts of HS1 were overwhelmingly positive, with very few negative impacts being cited, although in some cases interviewees described a lack of impact. It is important to note, however, that there may be some vested interests amongst interviewees, specifically:

- Some of the organisations we spoke to promote Kent as a business or tourist destination as part of their remit, and so naturally some of this 'promotional' language did come out in interviews, in particular when describing the business and tourism effects. Descriptions of local land-use and planning changes, in contrast, were less affected by this motivation.
- Some of the interviewees may have seen this study as an opportunity to lobby for additional transport services (such as the recommencement of international services, or provision of additional timetabling) and therefore may have over-played the importance
- of HS1.
- Many of the organisations we spoke to are working to develop the economic prospects for the region, and so may be more inclined to tell a positive story, or to highlight the 'good news' elements of their work rather than point to failures or lack of impact.

Changes in areas around stations

6.17 The most prominent change linked to HS1 was in the area around Ashford station. A number of different businesses have located here, including a high-profile hotel, a brewery, restaurants, a cinema, and a dance company.[22] Most significantly, Ashford has developed a commercial quarter in close proximity to the station, with the most prominent feature being a newly developed commercial building 'Connect 38', so called because of the 38-minute journey time to London. This 80,000 square foot development was built via a public-private partnership between Ashford Borough Council and a private developer (Quinn Estates), and was described by one interviewee as the largest speculative office development in the country for 30 years. Its tenants include mostly professional services firms (accountants, software developers and surveyors are amongst the tenant list), some of whom also have London offices. For businesses located in the building, which is just three minutes' walk from Ashford International station, trips to London to visit clients or attend meetings and events can be easily undertaken within the working day. Thus, this tells a clear story of a development for which HS1 is a key part of the rationale for the location.

[22] The Jasmin Vardimon dance company moved from two prior locations in Brighton and London to a single location in Ashford in Spring 2022, and several interviewees mentioned the choice of location as being clearly linked to HS1. We spoke to the company themselves, and the interviewee confirmed that connectivity was the key attraction of Ashford – providing access to London and Europe, and bridging the two former sites. Ashford Borough Council's role, providing a suitable space, was also highlighted.

"People based in CQ38 can get into London so fast. They can just walk across the road to the station, jump on a train, and be in London in 38 minutes"

6.18 Interestingly, however, interviewees described only limited retail and commercial offers within Ashford station itself. Several interviewees hypothesised that the station does not present viable commercial opportunities because commuters typically only pass through the station very briefly, as they move between rail and car.

6.19 Elsewhere, regeneration of areas in close proximity to stations has also been observed, but with less direct link to HS1. Canterbury, for example, has undergone a full residential and commercial redevelopment programme around the station area, although this was described as not having been driven by HS1. Strood (Medway) has similarly experienced regeneration around the station area, with a new (though relatively small) business centre being installed. A different type of development has occurred in areas where the cultural and creative sector is more prominent. Folkestone in particular was described as having experienced a change, with independent retailers having been supported to come in and take up premises near to the station, making for a vibrant and attractive retail offer. A bid is currently being prepared for Levelling Up Fund investment into the area between the station and the sea front, directly related to the presence of HS1.

6.20 In some areas, more limited change was linked by interviewees to a lack of suitable space – for example, interviewees described Thanet as having only limited land available for development in proximity to the station, which has constrained the opportunities for growth. Similarly, interviewees described only very limited change occurring in close proximity to Ebbsfleet station (a number of more complex factors were linked to the lack of development in Ebbsfleet, and this is discussed in further detail below).

6.21 We asked interviewees about the local transport offer in proximity to the stations, and more than one interviewee mentioned a shortage of taxi companies and the recent closure of two taxi firms in Ashford, with many drivers shifting towards food delivery services. This was contrary to interviewees' expectations, with several citing HS1 as creating a need for local transport to provide 'last mile' services.

Local business impacts

6.22 For businesses moving into the region, HS1 helps to provide an attractive location with excellent connectivity to London and Europe, allowing for fast, comfortable and reliable journeys to London – to meet up with customers and colleagues as well as to meet friends and enjoy the nightlife and culture of the capital. The opportunity to travel to more than one London terminus also adds flexibility and resilience; and the redevelopment of the King's Cross area makes arrival into St. Pancras yet more attractive. At the same time, a location in Kent allows for much less costly premises than in London, thanks to lower commercial property and rental values. Kent is also perceived to offer an attractive location for employees to live in, with attractive housing, good local provision of schools and facilities, and a pleasant 'leafy' environment (the quality of the housing situation is especially important when asking people to relocate). For some, there is also the benefit of a different talent pool – for example those seeking creative and digital employees.

"It is eminently possible to service clients in London from a location in Kent"

6.23 Interviewees described the draw for businesses as more than just a case of trading off between journey times and property prices – HS1 has bestowed a certain level of 'prestige' on the region, with interviewees claiming that it has helped to 'put Kent on the map', avoiding any perceptions of being a rural 'backwater'. The nature of rail travel, as a low carbon transport option, adds yet further to this modern reputation, allowing businesses to demonstrate their social commitment to decarbonisation by locating along the HS1 line. Interviewees gave the example of Brompton, whose plans to locate within easy access of HS1 are consistent with its ethos as a sustainable transport focused company. It should be noted, however, as pointed out by one interviewee, that HS1 does not offer services as fast as high-speed rail in some other countries, and therefore this reduces the attractiveness for some international companies.

6.24 Another example is the Maidstone Innovation Centre, which targets the medical technology sector, and leans on its link to similar businesses around St. Pancras, and onward links to the likes of Cambridge. Interviewees suggested this connectivity was a driver for tenants choosing to sign a lease in the Innovation Centre.

6.25 For tourism businesses, HS1 offers an important additional link to the region. A recent study by Visit Kent found that 54% of tourism businesses stated that HS1 had a positive effect on their business – attracting more tourists, and also enabling tourists to come from further afield. The rapid and comfortable journey from London is a big draw, and we heard that couples in particular are attracted to travel by HS1. In terms of growth opportunities for the future, we were told that sustainable tourism is a growth area, with 'rail first' being pitched as a low carbon tourism option. The region's vineyards are also hoping to attract more tourists by train, with the advantage that travellers can enjoy sampling wines without a drive home.

6.26 Beyond the direct beneficiaries, there has also been growth in businesses providing support services, night-time economy, cafes and so on. With population growth and an influx of wealthier individuals moving out from London, these services are reported to have benefitted from a more affluent client base. Ashford retail outlet, for example, reported that they have seen average spend per customer increase since the introduction of HS1.

6.27 With these benefits, however, there have also been some barriers to further development, or issues introduced by HS1. Firstly, the increasing viability of commuting to London has meant that local businesses must now compete with London firms on wages, as local residents have the opportunity to take up better paid jobs in the capital more easily than before. Interviewees noted that this is especially the case for the most senior jobs. The transition to more working from home brought about by the COVID-19 pandemic has further exacerbated this effect, with employees working from home two or more days per week and therefore almost indifferent between working in Kent and working in London (aside from the commuting costs, however, which are significant).

6.28 For other local businesses, the uncertainty brought about by slow change has been difficult: some businesses on sites around Ebbsfleet are reported to have been waiting for a compulsory purchase of their property to take place for the last ten years or more, due to the various factors which have hindered development in Ebbsfleet. This is unsettling and makes it

difficult for businesses to make long-term decisions around staff hiring and investment, which is likely to have suppressed economic growth.

6.29 Finally, for the tourism industry, there are some barriers to taking advantage of HS1. One is the 'last mile' issue – HS1 only takes travellers to key hubs, and it is not necessarily straightforward to make onward journeys from these stations. This may have led to some tourist destinations, which are less well served by the rail line (and onward connections), losing out to others. Some attractions are, however, investigating options to respond to this challenge – for example we were told of work with Brompton to develop e-bike hubs around the region, and some vineyards developing travel itineraries combining breweries and vineyards without the need to drive. Local transport operators and local bodies are working together to develop these connections, extending or developing routes linking HS1 stations and destinations, with integrated tickets. Nonetheless, this remains a barrier for tourists travelling by HS1.

6.30 Another barrier for the tourism industry is the price of fares and timetabling. Ashford Designer Outlet, for example, competes with Bicester Village – a shopping outlet located in Oxfordshire – a similar distance from London, but with a lower priced (non-high speed) fare. Tourists or leisure travellers, unlike commuters, often travel as groups – making travel by car a more economical option than purchasing three or four train tickets. Furthermore, timetables are built with commuters rather than tourists in mind – and one interviewee from the tourism industry told us that it would be advantageous for the industry if trains ran later into the evening and with additional services at weekends, to better serve the tourism industry.

6.31 Finally, multiple interviewees cited the recent withdrawal of international services to Ashford as being a significant barrier for business. Many businesses will have made location or operational decisions on the expectation of using those services, but with these having been suspended, businesses must find alternative travel routes. They also worry that this represents a regression of the area and how it is perceived. In the longer term, the withdrawal may lead to some relocations out of Kent.

Demographic impacts

6.32 The main demographic impact cited by interviewees was the influx of new residents into the area, predominantly individuals moving from London to relocate in Kent. Growing demand is perceived to have led to a rise in house prices and a changing demographic – the incoming residents are typically described as younger, wealthier, and more likely to be from ethnic minority groups.

6.33 Some interviewees raised the issue of rising house prices making it more difficult for local people to afford houses, although this was more often posed as a theory rather than supported by evidence. Instead, there was more concrete talk of unease or conflict, with some long-term residents feeling unhappy about the level of change, and the fact that the newest housing stock was predominantly being built for wealthier, incoming families rather than existing local residents. One interviewee referenced evidence of such conflict on social media, with some individuals happy with the pace of change in Ashford, and others expressing dissatisfaction about, for example, the loss of the cattle market and other town-centre developments.

> "An ongoing challenge is people moving into the area with lots of money, and a question of whether the local community is really benefitting"

Local planning impacts

6.34 As previously discussed, the major land use change cited by interviewees was the large amount of new residential housing. Interviewees described a significant valuation uplift being attached to proximity to HS1, and that private developers have responded to this opportunity, through developing 'build-to-rent' properties as well as residential properties for sale. The pace of development has been rapid, and interviewees were able to name specific new housing developments in areas such as Ashford, Chatham and Rochester.

> "HS1 really opens up the commuting market. It's so attractive for people to buy nice cheap houses in Kent and commute to London"

6.35 The planned garden town at Otterpool Park focuses its marketing on proximity to HS1. This angle was perceived to have been a focus for developers for most residential sites.

6.36 In contrast to the residential growth story, interviewees stated that commercial land use has not changed to the same extent. There has, however, been a marked increase in co-working space across urban, suburban, and rural parts of Kent. One interviewee reasoned that this reflects a trend of individuals choosing co-working spaces as an alternative to a small office in London, or a work from home setup in London – thanks to the fast links into London, it is feasible for employees to attend meetings or events in London when needed, but work from Kent for the rest of the time.

Barriers to and enablers of growth

6.37 Interviewees representing a range of different organisations and viewpoints gave an account of the coordinated action, driven by local government, which has resulted in Ashford's commercial and residential growth. This has been driven by a clear growth-focused strategy, lobbying efforts to ensure HS1 passed through the centre of the town, and a proactive and innovative approach to development – in particular the Commercial Quarter development and the Connect 38 building. Elsewhere, the Council has purchased portions of land and moved forward proactively with developing these areas. Several interviewees contrasted the Ashford story with Maidstone, where lobbying efforts had focused on ensuring that HS1 did not stop in the centre of the town but instead in the outskirts, and where there has not been such an explicit pro-growth strategy. Interviewees hypothesised that Maidstone's comparably lower commercial growth has been a result of this: by ensuring the station was located in the centre of town, Ashford has avoided 'last mile' issues and allowed businesses to benefit most fully from the services. This includes both for trips into London to visit clients, and also for businesses attracting tourists and other visitors from out of town. Interviewees told us, however, that Maidstone is now beginning to focus development sites around the HS1-served station, hoping to achieve some of the same growth that Ashford has experienced.

6.38 Several interviewees mentioned the science park ('Discovery Park') located at a site near Sandwich. A representative from Discovery Park was also interviewed as part of this study. The pharmaceutical company Pfizer formerly had a large presence at the site, but in 2011 reportedly withdrew 2,400 jobs, moving these to locations elsewhere. Local government stepped in to provide funding and create an enterprise zone, allowing the site to continue operation. The site now sustains more than 100 tenants. Interviewees described the continued success of the site as relating to the existing strong talent pool, the strategic location (which is facilitated by HS1) and the coordinated local government action after Pfizer's withdrawal.

6.39 Finally, several interviewees referenced the planned London Resort development around Ebbsfleet. This has not yet been granted planning permission, but if successful will bring a world-class 465-hectare entertainment resort to the banks of the Thames, with easy access to Ebbsfleet station. While the project goes through the planning process, the area is in a hiatus, awaiting the outcome. Interviewees cited a range of issues affecting development in Ebbsfleet, including land ownership and assembly issues, pollution and contamination, issues with supporting infrastructure, an unproven market for commercial space, over-provision of parking space directly around the station which is obstructing development, and a designated Site of Special Scientific Interest as part of the land. At nearby Gravesend, one interviewee described development as having been hampered by contamination issues, flood defences, and land being designated as green belt. Furthermore, both Ebbsfleet and Gravesend were described as struggling to support much land use change because of being, rather surprisingly, 'too close to Central London'. For these areas, interviewees suggested that there is not a sufficiently different proposition to life in London, thus making it harder to pull new residents out from London when compared with some of the more rural and attractive Kent locations which are only twenty minutes or so further down the line. Adding further weight to this argument, another interviewee explained that London was already relatively easy to access from Ebbsfleet, with multiple rail and road options available – meaning that HS1 was not a 'game-changer' in the way that has been seen in Ashford.

> "The connectivity alone wasn't enough to make it [Ebbsfleet] an attractive proposition"

6.40 Interviewees did, however, hold out hope for some of the areas that have not yet seen much development as a result of HS1. The planning process and land use change can be slow to occur. Ashford shows a story of a focused and proactive approach coupled with a clear and attractive proposition for both businesses and new residents coming into the area. Elsewhere, the proposition may not be quite so attractive, and other local issues (such as those around contamination and development obstacles for example) have slowed progress. But this does not mean development will not happen for those areas, it may just be that it has not happened yet.

Unexpected and wider impacts

6.41 All interviewees were asked about any other wider or 'knock-on' impacts that may have occurred as a result of the changes discussed above. Interviewees raised the following:

- The impact of population growth on local services (such as schools, dentists, healthcare and so on) which may not have kept pace with the growth, especially in Ashford which has experienced the largest population growth and is more likely to have attracted young families, who typically make greater use of such services. This was posed as a potential impact by interviewees, although none could point to direct evidence.
- A growing dependency on the rail network for business operations. Several interviewees pointed out that the weakness of dependency on a single transport mode is that when the services are disrupted (for example due to strikes or maintenance issues), this causes operational difficulties for the businesses, who find it difficult to replace with an alternative transport mode, since no other mode can provide such a fast and direct journey to London.

- The dissection of land as a result of building the line. Ashford in particular has been affected, due to the station coming into the centre of town. This has had implications for some businesses and functions (such as the cattle market) which had to be moved.

6.42 Interviewees were not able to cite any further impacts beyond those described above.

Conclusions from qualitative analysis

6.43 Below we summarise the findings from the qualitative research that was undertaken.

6.44 HS1 is associated with positive impacts for a variety of different economic sectors. Interviewees explained that by connecting Kent to London and (to a lesser extent) the continent in a fast, comfortable and reliable manner, HS1 allows businesses to combine a highly accessible location with relatively low property prices compared to nearby London, and an attractive region for employees to live in. Some notable businesses have relocated to Kent or are considering location in Kent, with Brompton Bicycle being the most frequently cited example, but also a proposed new film studios (Newtown Works) and a large-scale entertainment resort (London Resort). According to interviewees, many of these relocations would not have been considered without HS1.

6.45 Of all sectors, probably the most significant benefits have been to the tourism sector. Interviewees explained that HS1 brings more tourists into the region, in particular from London, and in general more affluent tourists. Couples tourism, wine tourism and sustainable tourism were all cited as being particularly bolstered by HS1. There are, however, some challenges which interviewees pointed to, such as around the cost of tickets, lack of evening and weekend services, and 'last mile' travel issues, where HS1 could better serve the travelling public in order to maximise benefits for the sector.

6.46 The arts and culture sector was perceived to have thrived in Kent over the last twenty years or so, with creative and digital hubs forming in towns such as Margate and Folkestone. HS1 was described by interviewees as a facilitator of this growth – allowing for relocations from East London, and contributing to the development of a reputation for a vibrant cultural scene. However, the extent of HS1's role in these changes is harder to ascertain. HS1 was not seen as a critical success factor by interviewees, but rather an additional factor which helped to support other drivers of growth.

6.47 In terms of demographic changes, interviewees described a transition towards a more 'London-like' population in areas that have seen population growth – with incoming populations generally younger, more affluent, and more likely to be of an ethnic minority than the existing population. Although there was some discussion of conflict between the views of incoming and established residents, and some interviewees pointing to a potential strain on local resources, these issues were not generally given much weight by interviewees.

6.48 The most apparent growth resulting from HS1 has been in Ashford, which has experienced both significant population growth and also development of new commercial spaces and opportunities in the areas adjacent to the station. Ashford's growth story is one of multiple factors convening – a pro-growth local government strategy, an innovative and proactive approach to local planning (such as the creation of a public-private partnership to develop a new commercial building), and the decision to locate the station in the centre of town. Elsewhere, the impact of HS1 is less apparent, with various factors having hampered development, including factors related to planning (such as a lack of developable space and

green belt or other planning restrictions) and unfortunate circumstances (such as site contamination preventing development moving forward).

6.49 There are, however, still considerable plans that have not yet been realised – including the proposed London Resort plan near Ebbsfleet, the development of Ebbsfleet Garden City, and planned housing developments in Maidstone and elsewhere. Thus, with time, we may expect the impact of HS1 to become more prominent for those areas which have not yet experienced large benefits. Ashford has been an 'early winner' of HS1, thanks to the combination of significant journey time improvements, a proactive local government and a clear and attractive proposition for business and residents. Elsewhere, without such a confluence of positive factors, benefits have not (yet) emerged to the same extent. Finally, it is noted that while the econometric analysis showed Kent as unable to compete with clusters of businesses elsewhere in the South East, findings from the qualitative research suggest that some notable clusters may be emerging. This finding would be worth revisiting, both qualitatively and quantitatively, in future evaluations.

7 Transport impacts

Approach

7.1 The transport impacts of HS1 include:

- Passenger number growth – how HS1 has stimulated additional growth in domestic and international rail demand and associated revenue
- Journey time savings for new and existing passengers on domestic and international passenger services
- Rail performance – the impact of HS1 on rail service punctuality and reliability for domestic services
- On-train crowding – how the additional domestic rail capacity that HS1 has facilitated has affected on-train crowding
- Modal shift – from car to rail due to enhanced domestic services and from air to rail due to enhanced international passenger services.

7.2 As established in Chapter 1, integral to the assessment of HS1's transport impacts has been the construction of a Counterfactual Scenario. As well as setting out the approach to assessing the transport impacts, this chapter also sets out how the Counterfactual Scenario has been developed and presents the results.

International

7.3 We developed a spreadsheet model to assess the transport impacts of HS1 on international patronage levels. This compared the Counterfactual and Outturn Scenario international timetables with air services to the principal international destination (Paris, Brussels, Amsterdam). The model was calibrated against observed rail and air market share. We do not consider that car is a relevant alternative mode for international services, since choice of a car journey to the continent instead of public transport (rail or air) is unlikely to be made solely for reasons of journey time advantages and hence improvements to rail journey times due to HS1 are unlikely to have any significant impact on relevant modal shares.

7.4 While the air travel market has also developed significantly since 2003, with low cost carriers taking an increasing share of short-haul air travel in Europe, there have not been any major underlying structural changes in the London-Paris and London-Brussels air markets, with competing air services from multiple airports at each city (Heathrow, Gatwick, Stansted, Luton, London City for London, Charles de Gaulle, Orly and Le Bourget for Paris, and Brussels and Charleroi for Brussels).

7.5 Since HS1 opened, air traffic volumes and market shares on both city-pairs have fallen, which can reasonably be attributed to increased rail competition from international passenger services, with further falls following on from the introduction of faster services made possible once HS1 was opened.

Timetable impacts

7.6 The spreadsheet model was based on the observed market share in journeys between London and Paris/Brussels by international rail (supplied by Eurostar) and by airlines (from publicly available CAA air passenger route analysis[23]). A counterfactual position was created by assuming that the pre-HS1 (2002) market shares were retained for all years between 2002 and 2019 and applied to the observed total market for each of these years. This is a somewhat conservative assumption because it does not include the growth in the overall market that theory suggests will come about due to the improvement in rail journey times.

7.7 To estimate the rail user journey time benefits this change in market share was assumed to be associated with the decrease in rail journey time, as a result of the introduction of HS1. Similarly, the revenue benefit was calculated as the increase in rail journeys multiplied by an average passenger yield (estimated from published Eurostar accounts) with an assumption that this yield was constant over time (in real terms). The impact of any associated change in frequency or access times of either rail or air services on user benefit was assumed to be negligible.

Fares impacts

7.8 Although individual international rail fares can be publicly identified through the Eurostar website, detailed revenue and yield data is not available and there are no counterfactual fares available. We have therefore assumed no systemic changes in international rail fares have been introduced as a result of the availability of HS1 infrastructure.

CO_2 emissions impacts

7.9 In addition to the calculation of impact of the change in market share on demand, revenue and rail user benefits described above, we have calculated a saving in CO_2 emissions from the reduction in air demand and hence flight numbers and aircraft size between London and Paris/Brussels. This has been calculated using the difference in air mode share described above, expressed in terms of passenger kilometres, multiplied by a CO_2 emissions per passenger factor. The latter was calculated using detailed knowledge of the fleet mix on these services gained from Official Airline Guides and an assumed average load factor of 80%, leading to a figure of 0.17 $kgCO_2e$/passenger km.

Domestic passengers

7.10 As described below, we have used the well-established MOIRA 2.2 industry demand and revenue modelling software to estimate the impacts of the introduction of HS1 infrastructure. While MOIRA 2.2 forecasts the impacts of timetable changes using well-established principles based on historical observations of passenger behaviour, it is not able to take account of any impacts resulting from population or employment changes resulting from HS1-enabled services (i.e. the impacts reviewed in Chapter 3 above).

Timetable impacts

7.11 Modelling of actual passenger usage against the Counterfactual Scenario is a robust method to support the assessment of timetable impacts on demand. In addition, changes to the South Eastern franchise timetable without High Speed services can be captured by the same

[23] **CAA UK Airport Data**

comparison, as can the impacts of other related changes such as the repurposing of the former international platforms at Waterloo, which affects South Western franchise services.

7.12 Domestic patronage levels were modelled using industry-standard MOIRA 2.2 software, which compared the Counterfactual Scenario timetable with the Outturn Scenario (the actual December 2019 timetable) and estimated the demand impact driven by changes in GJT, which incorporates the timetable characteristics into a single measure including:

- journey time
- service frequency
- the impact of interchanges.

7.13 MOIRA 2.2 routinely enables the calculation of changes between the December 2019 Outturn and the Counterfactual Scenario timetables in terms of:

- Passenger revenue which affects the finances of the operator and ultimately national government
- GJT benefits to rail users
- Time spent by rail users in crowded conditions.

Fares impacts

7.14 While MOIRA 2.2 is a robust method of calculating the impacts on demand of timetable changes, it is unable to model the effect of the premium fare relative to classic rail that journeys on HS1 domestic services incur, as described in Chapter 2 (paragraph 2.23 onwards). The impact of fare changes has therefore been considered separately from the MOIRA 2.2 analysis.

7.15 This calculation has been undertaken in two stages. The first calculation accounts for the theoretical reduction in demand due to the premium fare. As this impact will already be included in the Outturn 2019 base demand data, the difference in demand between the Outturn and Counterfactual Scenarios has been made smaller by applying an *uplift* in demand in the Counterfactual, generated by a fare *reduction* on flows between domestic HS1 high speed stations and London. The values of the fare reductions have been calculated by ticket type and weighted by the proportion of the demand for the flow that use the high-speed speed service.

7.16 These reductions have been mapped to equivalents by journey purpose and industry standard fare elasticities[24] applied to give factors representing a demand (and revenue) impact by purpose for each flow. Applying these factors decreases the difference in journeys between Outturn and Counterfactual Scenarios and increases the difference in revenue.

7.17 Chapter 2 describes the impact of the fare premium on passengers, whereby the increase in fare (the 'user charge') offsets some of the benefit of time savings. This has been represented in the analysis by converting the fare increase into an equivalent increase in GJT (using TAG values of time) to calculate a reduction in GJT benefits, which has been separately identified as the impact of the user charge.

[24] Taken from Passenger Demand Forecasting Handbook version 6 Table B3.2

Other impacts

7.18 Where journeys are abstracted from road travel, it is possible to estimate the benefits in terms of reduction of CO_2 emissions and other marginal externalities, such as road traffic incidents. These have been estimated using further output from MOIRA 2.2 in terms of the difference in passenger miles, using an assumed proportion of incremental passenger miles that are diverted from car.

7.19 In principle, increases in rail patronage levels can come from a combination of new passenger trips and diversion from car journeys, with the levels of diversion able to be assessed following the approach in TAG. However, in the case of domestic high-speed services, the level of abstraction is likely to be relatively small, given that most passengers are travelling into central London for which the extra journey time advantage of the Outturn Scenario compared with the Counterfactual Scenario is unlikely to be the key factor in modal choice, given the low road traffic speeds and difficulties in car parking there. The recommended TAG default values for this 'diversion factor' for the South East to London is 21% (i.e. 21% of new rail travellers would previously have travelled by car). The view that this factor might actually be lower for domestic high-speed services (given the higher differential with car speeds) is reinforced by a value of 11% reported in the first evaluation of HS1.[25] Nonetheless, for consistency with TAG we have adopted the 21% value found in the Data Book.

Counterfactual timetable

7.20 To assess the transport impacts of HS1 since its opening, two scenarios have been defined: the Outturn and Counterfactual. The Outturn Scenario is the present-day rail service and its growth since HS1 Section 1 opened in 2003. As previously set out, for this purpose "present-day" is defined as the December 2019 timetable.

Background

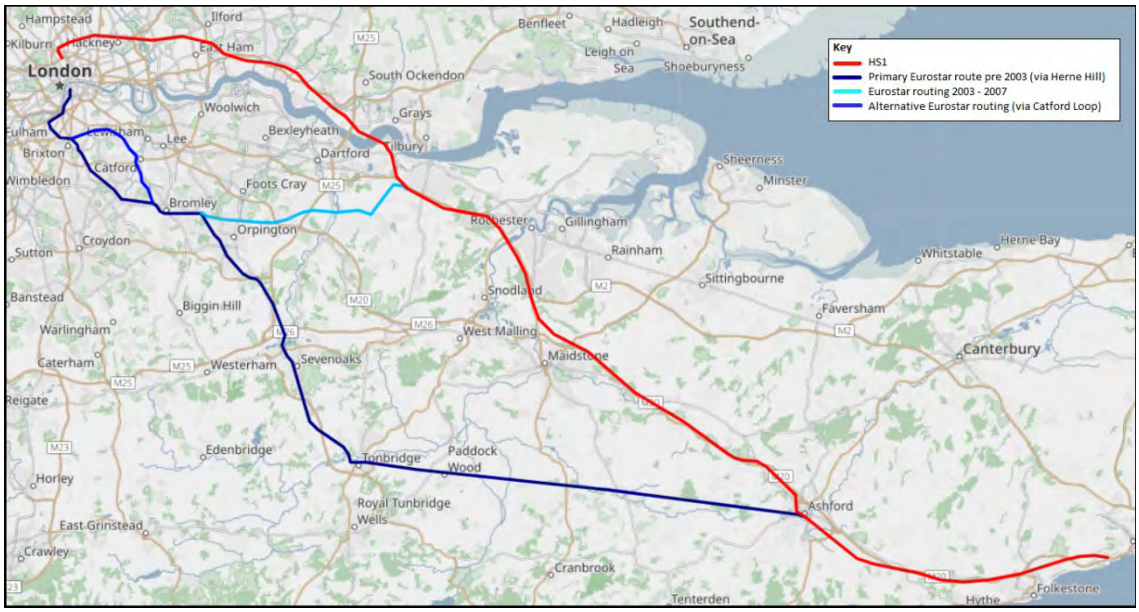
7.21 The first phase of HS1 opened in September 2003 between the tunnel and Southfleet Junction in Kent, with a connection to the classic lines via Fawkham Junction. Until the second section of HS1 to St. Pancras opened in November 2007, international services continued to have Waterloo as their London terminus station.

7.22 Prior to the opening of HS1 Phase 1 in 2003, international services were routed over infrastructure primarily used by South Eastern services, including the main lines between Bromley South, Orpington, Sevenoaks, Tonbridge and Ashford. Towards Waterloo, services operated either via Herne Hill or via the Catford loop. On occasions, international services operated via Maidstone instead of Tonbridge.

7.23 From 2007 with the opening of HS1 Phase 2 infrastructure, international services no longer needed to run on the conventional South Eastern network, freeing up capacity for changes to South Eastern franchise services. The major change to these domestic services occurred in 2009 when domestic high-speed services between Kent and London launched. The introduction of these services also led to a recast of South Eastern franchise services.

[25] See Figure 2.12 of the first evaluation report

Figure 7.1: Map of HS1 and historical Eurostar routeing over conventional rail lines



Source: Steer

7.24 Since the first evaluation, further service changes have been made to rail services as a result of HS1. The most significant of these is the South Western Railway May 2019 timetable change which made use of remodelled international platforms at Waterloo to provide additional services, but which may also have indirectly allowed other timetable improvements for operators across the South East.

Defining the counterfactual

7.25 The Counterfactual Scenario is the rail network as it would have existed without HS1, including any changes to services, infrastructure and demand from 2003 to the present day that would have occurred. The Counterfactual has been defined relative to the Outturn Scenario.

Methodology

7.26 Using the ATTUne Timetable Planning system, the pre-2003 international service paths to Waterloo have been overlaid onto the December 2019 timetable. Where it is clear track capacity does not exist, the service pattern has been amended using elements of historic timetables. It is important to note that the international service paths include paths that were not used by timetabled services. Paths were provided in the working timetable to allow the frequency of international services to increase as demand grew. Sufficient paths were made available to cater for projected growth into the mid-2020s, around 30 years after services commenced operating from Waterloo. As the international patronage did not grow at the rate expected when the paths were allocated, there were a large number of unused international paths in the pre-2003 working timetable.

International services

7.27 As noted above in Chapter 2, prior to 2003, Eurostar operated between 25 and 30 services per day in each direction to or from London Waterloo. In 2019, Eurostar operated between 27 and 30 services per day. This is shown in the table below, which replicates Table 2.1.

Table 7.1: Difference in Weekday Eurostar service Quantum 2001 – 2019

Destination	May 2001: Wednesdays	May 2001: Fridays	May 2019: Wednesdays	May 2019: Fridays	Difference: Wednesdays	Difference: Fridays
Paris	16	20	17	19	+1	-1
Brussels	9	10	9	10	-	-
*Amsterdam**	*0*	*0*	*4*	*4*	*+4*	*+4*
Marne la Vallée (Disneyland Paris)	0	0	1	1	+1	+1
Total	**25**	**30**	**27**	**30**	**+2**	**-**

*Amsterdam services are extensions of services shown in the Brussels row, not additional paths from London.
Source: Eurostar, Steer analysis

7.28 The Counterfactual Scenario assumes that the pre-2003 Eurostar timetable continues to operate, with some minor differences. It is assumed that the extensions to Amsterdam do not happen. This is primarily due to the additional journey time incurred in operating services to and from London Waterloo, resulting in journey times which would be less competitive with air travel. The service frequency to Paris and Brussels has not changed significantly since the opening of HS1 and is therefore unchanged in the Counterfactual. It is assumed the less frequent services to Marne la Valle would also operate in the Counterfactual Scenario.

7.29 Calculations were undertaken to confirm that the resulting levels of loading on Counterfactual services were not unrealistic. The lower levels of demand in the Counterfactual are compared with the reduced capacity on the Class 373 rolling stock (750 seats) by contrast with the higher capacity in the Class 374 in the Outturn case (902 seats) that were used to calculate average load factors. Our analysis shows that load factors would remain manageable.

7.30 The pre-2003 timetable Eurostar paths have been added into the ATTUne timetable planning system and overlaid onto the December 2019 timetable in order to establish the changes required to South Eastern and South Western franchise services.

South Eastern services

7.31 The South Eastern franchise was operated by Govia using the “Southeastern” brand name during the base year 2019. The Counterfactual Scenario represents the South Eastern train service pattern without HS1, with international passenger services still operating on the classic network and without domestic high-speed services.

Domestic high-speed services

7.32 All domestic high-speed services operating via HS1 have been removed from the Counterfactual modelling timetable. Details are shown in Figure 7.3.

Table 7.2: Domestic High Speed Services removed from the Counterfactual timetable

Service Code	Description	Number of daily services removed
6470	St. Pancras – Ashford/Ramsgate	76
6480	St. Pancras – Ebbsfleet/Ramsgate	69
6490	St. Pancras – Ebbsfleet	1
Total		**146**

Source: Steer

Classic rail services

7.33 The timetable for classic rail services needs to be amended compared with the December 2019 timetable for two reasons:

- to provide additional connectivity between London and Kent after the high-speed domestic services have been removed
- to avoid conflicts with international passenger services between London Waterloo and the Channel Tunnel.

7.34 With international passenger services operating over the classic network to Waterloo a number of services in the December 2019 timetable would not be able to operate due to a lack of track capacity, so the Counterfactual modelling reverts to a pre-2003 service pattern for some service groups.

7.35 The 2002 winter Eurostar timetable has been overlaid onto the December 2019 timetable. The timetables are not compatible without amendments. The Eurostar services conflict or run through numerous South Eastern franchise services. The 2019 timetable does not have enough spare track capacity to be able to operate international passenger services to and from London Waterloo without amendment.

7.36 The changes set out in Table 7.3 have been made to conventional South Eastern services.

Table 7.3: Change in number of SE services between December 2019 and Counterfactual timetable

Service Code	Description	Number of services, December 2019	Number of services, Counter-factual	Difference in number of services
6020	London - Hastings/Tunbridge Wells via Tonbridge	155	117	-38
6040	London - Dover/Ramsgate via Chatham	153	161	8
6050	London - Ramsgate via Canterbury	94	91	-3
6060	London - Ashford via Maidstone	84	91	7
6520	London - Bromley South/Orpington via Herne Hill	168	90	-78
6550	London - Orpington/Sevenoaks via Grove Park	301	248	-53

Source: Steer

7.37 Further detail regarding the reason for the changes is set out in Appendix F.

South Western Railway services

7.38 International services operated to and from London Waterloo International station until 2007. This involved international services operating over a constrained route section between nine Elms Junction and Waterloo. Waterloo domestic station consisted of platforms 1-19, with Waterloo International consisting of platforms 20-24.

7.39 Between 2016 and 2018 Waterloo station was upgraded with the former international platforms reconfigured for domestic use. The rebuilding programme also reconfigured platforms 1-4 to allow longer 10-car trains and included associated track and signalling enhancements.

7.40 South Western Railway commenced operations using platforms 20 to 22 in December 2018, and platforms 23 and 24 from May 2019. The South Western Railway domestic service pattern has changed since 2003, with increases in frequency and train formations.

7.41 The Counterfactual Scenario represents the South Western service pattern without HS1, with international passenger services still using the international platforms. In the Counterfactual Scenario, South Western Railway services are not able to use platforms 20-24.

7.42 Shown in Table 7.4 are resultant differences in number of South Western franchise services:

Table 7.4: Change in number of South Western franchise services between December 2019 and Counterfactual timetable

Service Code	Description	Number of services, December 2019	Number of services, Counter-factual	Difference in number of services
6710	Waterloo-Weybridge/Hounslow/Windsor/ Shepperton	300	315	-15
6720	Waterloo - Reading/Aldershot	243	252	-9

Source: Steer

7.43 Further detail is provided in Appendix F.

Summary

7.44 Overall, there is a reduction in total number of services in the Counterfactual modelling timetable compared with the December 2019 timetable, but this varies depending on the service group. The biggest differences are:

- the addition of international passenger service paths between the Channel Tunnel and Waterloo
- the removal of domestic high-speed services between Kent and London St. Pancras.

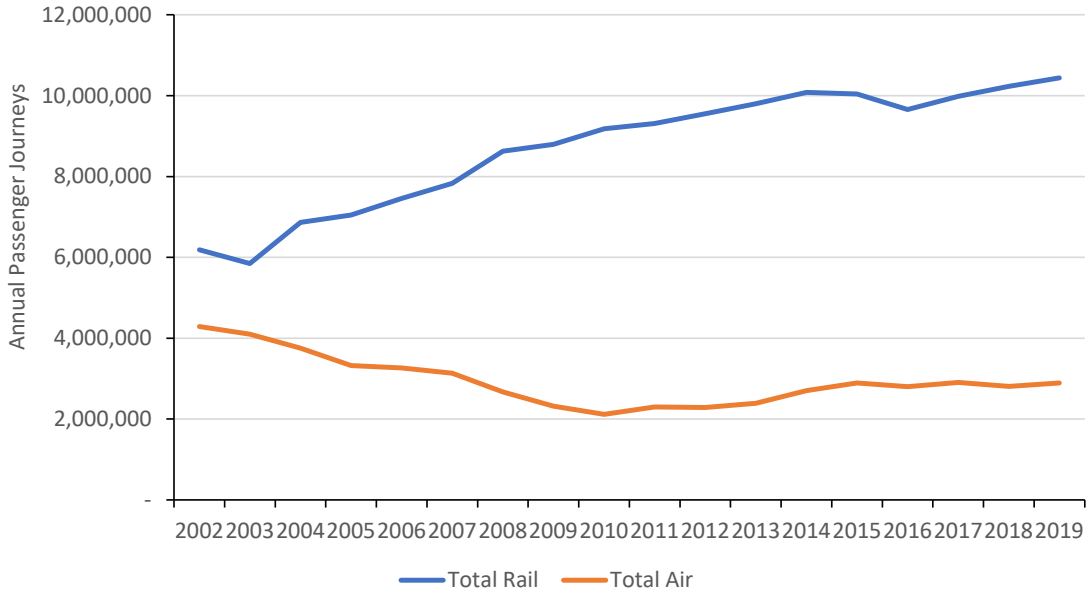
7.45 All other timetable changes are knock-on effects relating to one of the above changes, either to improve connectivity between London and Kent following the removal of domestic high speed services, or amendments to services which would conflict with international passenger service services and exceed available track capacity.

International transport impacts

Impact on passenger demand and revenues

7.46 Shown in Figure 7.2 is the absolute demand values for both air and rail for the London-Paris and London-Brussels international travel routes. It shows that there is a general trend of an increase in the number of rail passengers (from 5.9 million to 9.2 million) and a decrease in the number of air passengers for both O-D pairs simultaneously in the years around the opening of HS1, between 2003 and 2010, and a general increase in the overall market (from 11.3 million to 13.3 million) since then.

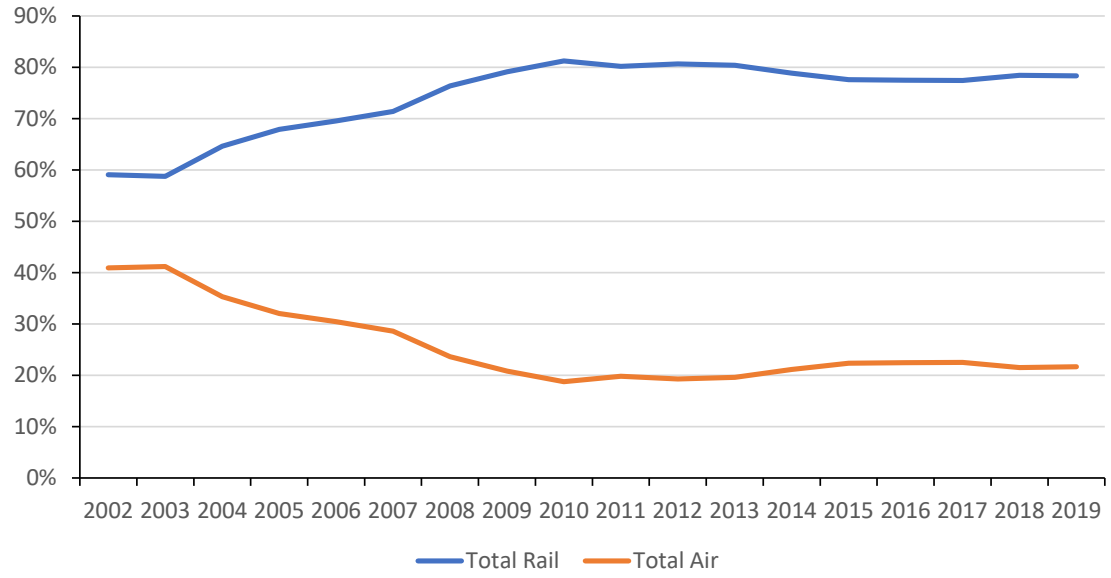
Figure 7.2: Absolute demand values for international rail and air travel between London-and Paris/Brussels



Source: Eurostar, CAA, Steer analysis

7.47 The demand split between rail and air for London-Brussels and London-Paris is shown in Figure 7.3. It highlights the significant mode shift in favour of rail travel over these years, increasing from the low 60s (59% in 2003) to the low 80s (81% in 2010). Since 2010 the rail mode share has stabilised at around 80% (78% in 2019).

Figure 7.3: Demand split between rail and air for international travel between London and Paris/Brussels



Source: Eurostar, CAA, Steer analysis

7.48 What these two figures suggest is that the opening of HS1 led to an increase in rail's share of the London to Paris and London to Brussels markets, but after 2010 rail's market share fell back slightly. A reasonable hypothesis is that the market share growth that occurred to 2010 was driven by the journey time improvements that HS1 delivered, but since then price competition has been the principal determinant of the share of a growing market.

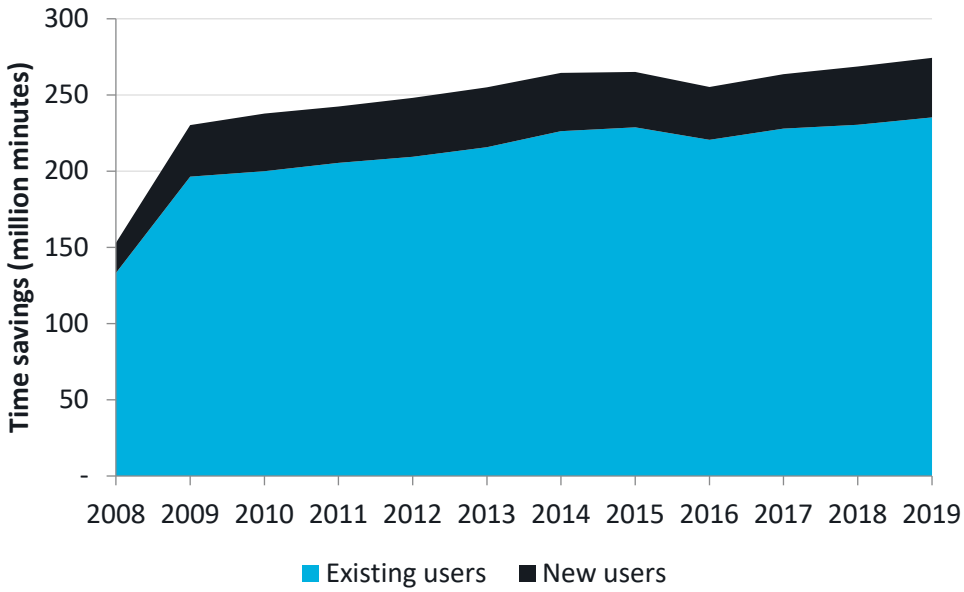
7.49 The increase in revenues which can reasonably be attributed to the introduction of HS1 is an economic benefit of the scheme. We have estimated this increase in revenue using the approach outlined from paragraph 7.6 above. The international services revenue increment associated with HS1 in 2019 is estimated to be £238 million.

International passenger journey time savings

7.50 The annual international passenger journey time savings calculated using the methodology outlined from paragraph 7.6 above are shown in Figure 7.4. Time benefits are attributed in full to the base rail mode share (in 2002) and using the 'rule of a half' to users that transfer between air and rail, due to the journey time improvement associated with the introduction of HS1. The methodology depends on the assumption that the Counterfactual mode share is equal to the mode share pre-HS1. This been applied from the start of the evaluation period in 2009 (full HS1 time benefits having been realised since 2007). The aggregate journey time improvement in 2019 was 274 million minutes.

7.51 Extending the market growth trend observed since 2010, the cost benefit analysis calculations set out in Chapter 8 assume that post 2019 levels international demand grows at 1.5% per annum until twenty years after the modelled year. Thereafter, it is assumed that demand grows in line with population growth, which is consistent with the TAG-defined "demand cap" applied to rail cost benefit analysis.

Figure 7.4: Calculated historical passenger journey time savings for international services

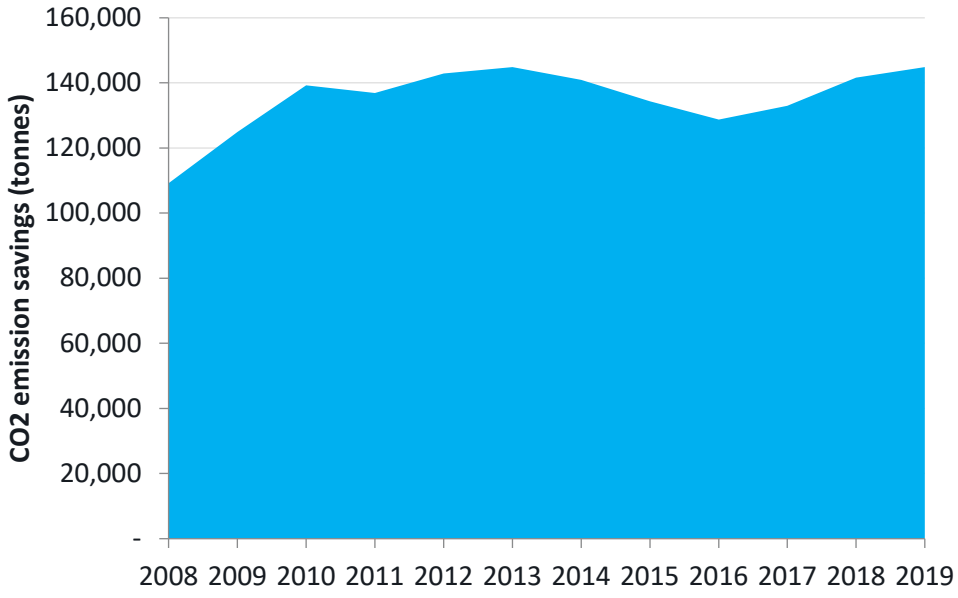


Source: Steer analysis

Aircraft CO_2 emissions savings

7.52 CO_2 emission savings from the reduction in international aviation have been calculated using the method described from paragraph 7.9 above. Benefits have been calculated for the full years since the full HS1 opening in November 2007, and these vary between 125,000 and 145,000 tonnes of CO_2 per annum, as shown in Figure 7.5. We have assumed that the 2019 benefit of 145,000 tonnes grows in line with international rail passenger numbers.

Figure 7.5: Calculated historical emission savings for international travel



Source: Steer analysis

Domestic transport impacts

Impact on passenger demand and revenues

7.53 As noted above, the domestic transport impacts are based on an assessment of the impact of the Counterfactual Scenario timetable versus the December 2019 Outturn Scenario timetable, using MOIRA 2.2 software.

7.54 The following tables show demand (Table 7.5) and revenue (Table 7.6) changes split by service for all flows affected by the difference in timetable. This means it captures flows that are made entirely on domestic high speed services (e.g. Canterbury to London), flows that might use high-speed domestic services for just part of the journey (e.g. Ashford International to Nottingham) and other flows affected by changes to other domestic services, whether they be on South Eastern or South Western franchise services. In addition to the impact of the timetable change (modelled in MOIRA 2.2), these forecasts reflect the premium fares applied to the use of high-speed services, as described from paragraph 7.14 above.

7.55 The figures shown are the sum of the changes observed when comparing the Outturn December 2019 timetable to the Counterfactual timetable in MOIRA 2.2, meaning a positive value represents a higher outturn number in the revenue and journeys in December 2019 than in the Counterfactual. The numbers in the table show the difference between the two scenarios for the full year to December 2019[26]. Table 7.5 shows the overall positive impact of the high-speed domestic services on total rail demand and that around 60% of demand on high-speed services would otherwise have travelled on conventional South Eastern franchise services. Other changes to South Eastern and South Western franchise services also result in changes to demand on these services. For context, there were 183 million journeys on South Eastern services in 2019, so the net incremental growth represents an additional 4.2% of journeys on the franchise.

Table 7.5: Overall annual (2019) domestic passenger demand changes by journey purpose (000s)

Journeys increment ('000s)	Business	Commuting	Leisure	Total
High-Domestic high speed services	2,629	9,380	3,762	15,772
Other South Eastern franchise services	-1,608	-5,206	-2,270	-9,084
Other services	145	793	29	967
Total GB rail	1,166	4,967	1,521	7,655

Source: Steer analysis of MOIRA 2.2 modelling

7.56 Table 7.6 shows the equivalent for revenue showing a very similar pattern.

[26] Strictly speaking MOIRA2.2 does not allow supply revenue and journeys by calendar year, we have used the closest available data for the year to September 2019.

Table 7.6: Overall annual (2019) domestic route revenue changes by journey purpose (£m)

Revenue increment (£ millions)	Business	Commuting	Leisure	Total
High-Domestic high speed services	38.2	109.6	47.9	195.8
Other South Eastern franchise services	-23.2	-61.4	-30.4	-114.9
Other services	0.8	1.7	0.7	3.1
Total GB rail	**15.9**	**49.9**	**18.3**	**84.0**

Source: Steer analysis of MOIRA 2.2 modelling

7.57 The majority of change observed is in the commuting market, which accounts for approximately two-thirds of the increase in both journeys and revenue.

7.58 The largest forecast journey number increases are shown in Table 7.7 below.

Table 7.7: Largest journey number changes (2019)

Flow	Journeys Increment (000s)
Total increases in journeys	7,655
Ebbsfleet International - London BR	1,700
Staines and neighbouring stations - London BR	618
Ashford International - London BR	321
Sevenoaks - London BR	248
Tonbridge - London BR	194
Tunbridge Wells - London BR	172
Canterbury BR - London BR	167
Gravesend - London BR	152
Clapham Junction and neighbouring - London BR	145
Clapham Junction and neighbouring - Staines and neighbouring	133
Rochester - London BR	128
Reading and neighbouring - Staines and neighbouring	127
Ashford International - Canterbury BR	122
High Brooms - London BR	106
Kent House - London BR	75
Tunbridge Wells - Tonbridge	73
Folkestone Central - London BR	72
London BR - Penge BR	69
Sevenoaks - Tonbridge	68
Paddock Wood - London BR	67

Note: London BR is an amalgam of the principal central London stations
Source: Steer analysis of MOIRA 2.2 modelling

7.59 As is to be expected, the most significant flow is the new one between Ebbsfleet International and London BR, where the table shows all of the December 2019 demand, although much of this demand will have transferred from neighbouring stations.

7.60 The largest changes to other flows split into four categories:

- Where the most significant improvements to London have been introduced by the high-speed line, such as from Ashford and Canterbury.
- Other intermediate flows not involving London (such as Ashford to Canterbury) are included as they will have benefitted from improvements in frequency from the introduction of high-speed services.
- Flows on Southwestern which benefit from increased capacity. Here flows have been aggregated along the line of route in the MOIRA 2 South Eastern version used for this analysis, so, for example, Staines, Reading and Clapham Junction together represent all stations on the route between Reading and Waterloo.
- Flows on conventional South Eastern franchise services, such as Sevenoaks to London BR which benefit from the South Eastern franchise timetable recast in terms of frequency and capacity.

Effect of high-speed fares premium

7.61 The high-speed services fare premium reduces the beneficial impact of the journey time improvements and the net impacts shown above take this into account (see Table 2.2 for examples of the fare premiums applied). The effect of the fares changes is shown in the tables below, which include revenue and journey increments due to faster services, with and without the effects of premium fares, for demand served by HS1 services.

Table 7.8: Impact of fares on journeys increment due to domestic high-speed services on HS1-served stations (2019 levels)

Journeys Increment (000s)	Business	Commute	Leisure	Total
Journeys increment – no fares effect	2,700	9,698	4,128	16,527
Journeys increment – with fares effect	2,629	9,380	3,762	15,772
Impact of fares on journeys increment	**-71**	**-318**	**-366**	**-755**

Source: Steer analysis of MOIRA 2.2 modelling

7.62 The impact on passenger revenue is shown in the table below. Note that the impact of premium fares is to increase revenue despite a reduction in journey numbers. This is due to the willingness of the passengers in this rail market to pay the increased fares, which results in fewer passengers but greater overall fare revenue.

Table 7.9: Impact of fares on revenue increment due to domestic high-speed services on HS1-served stations (2019 prices and levels)

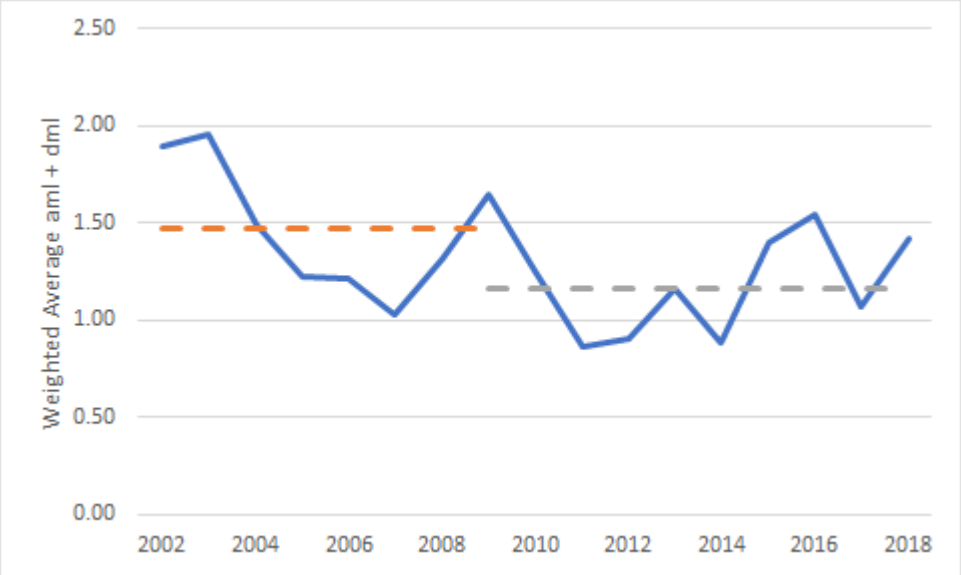
Revenue Increment (£ millions)	Business	Commute	Leisure	Total
Revenue increment – no fares effect	35.5	102.8	47.4	185.8
Revenue increment – with fares effect	38.2	109.6	47.9	195.8
Impact of fares on revenue increment	**2.7**	**6.8**	**0.5**	**10.0**

Source: Steer analysis of MOIRA 2.2 modelling

Impact on performance

7.63 The impact on performance due to the introduction of HS1 services was assessed using RUDD 2019 data on AML (Average Minutes Late) and DML (Deemed Minutes Late)[27] before and after 2009. By combining the train operating company (TOC) lateness figures with the Network Rail lateness figures, we were able to calculate an 'average lateness' figure between each HS1-served station and London BR. A high-level summary of the impact of performance has been calculated by combining average lateness for all the flows calculated using an average weighted by demand. The resulting metric is shown in Figure 7.6.

Figure 7.6: Weighted average minutes lateness for HS1 served stations (calculated using RUDD 2019)



Source: Steer analysis

7.64 This chart also shows dotted lines representing averages pre- (orange) and post-introduction (grey) of domestic high-speed services. This analysis shows that on average across the network there was a reduction in delays of 18 seconds per journey post-HS1 introduction in comparison to pre-HS1. This figure of 18 seconds, when monetised using post-HS1 demand and TAG appraisal methods, equates to roughly £1.3million per year. While analysis gives an approximation of the impact, this scale of this benefit was not considered significant enough to warrant further work leading to its inclusion in the cost-benefit analysis. The low level of impact may reflect the fact that most domestic high-speed journeys involve the use of the classic network as well as HS1.

Passenger journey time savings

7.65 The table below shows the aggregate passenger journey time savings due to the introduction of HS1 services based on a comparison of the December 2019 timetable with the Counterfactual timetable. The table shows a split of the savings on the high-speed and other South Eastern franchise routes compared with the savings on other routes calculated by

[27] AML and DML defined in this document: https://www.raildeliverygroup.com/about-us/publications/acop/287-rdgntfdorpm-final/file.html

MOIRA 2.2 and adjusted by the impact of the fare premium. This split has been calculated pro-rata to journeys on the different services.

Table 7.10: Aggregate domestic passenger journey time savings due to timetable change (2019 levels)

Aggregate generalised journey time minutes (millions)	Business	Commuting	Leisure	Total
HS and Other South Eastern services - existing users	66.5	196.9	105.8	369.2
HS and Other South Eastern services - new users	8.5	27.8	12.6	48.9
Other services - existing users	17.6	48.0	20.8	86.4
Other services - new users	1.7	5.2	2.6	9.5
Total GB rail	**94.3**	**277.9**	**141.8**	**514.0**

Source: Steer analysis of MOIRA 2.2 modelling

Impact of crowding

7.66 The MOIRA2.2 modelling also allows the identification of the benefit to passengers of the additional train capacity which manifests itself as a reduction in the time passengers spend in crowded conditions. By combining with demand changes in a calculation consistent with the above time savings calculation, crowded time savings have been calculated and shown in Table 7.11.

Table 7.11: Aggregate crowded time saving due to timetable change (million minutes, 2019 levels)

Aggregate crowded minutes (millions)	Business	Commuting	Leisure	Total
HS and Other South Eastern services - existing users	6.5	36.2	3.8	46.5
HS and Other South Eastern services - new users	0.0	0.5	0.0	0.5
Other services - existing users	6.4	30.6	3.3	40.3
Other services - new users	0.1	0.5	0.0	0.6
Total GB rail	**12.9**	**67.7**	**7.2**	**87.8**

Source: Steer analysis of MOIRA 2.2 modelling

7.67 Overall, the impact of crowding is therefore shown to be small, at 17% of the net effect of journey time savings and fares impacts. The saving on Southwestern services is larger, as the additional frequency provides additional capacity.

User charges

7.68 The benefits achieved through faster journey times for passengers using high- speed services are partially offset by the additional fare premium they have to pay. This can be translated into the same aggregate journey time minutes basis as the savings themselves using TAG values of time. The user charge disbenefits (so negative signs) are shown in Table 7.12. These apply on high- speed services only, as they are not applicable to other services.

Table 7.12: User charges disbenefits for passengers paying high-speed service premium (million minutes, 2019 levels)

User charge in minutes (millions)	Business	Commuting	Leisure	Total
Existing users	-16.8	-79.9	-22.0	-118.7
New users	-1.4	-7.9	-2.0	-11.3
Total user charge	**-18.2**	**-87.8**	**-24.1**	**-130.1**

Source: Steer analysis of MOIRA 2.2 modelling

Non-user benefits

7.69 Non-user benefits are calculated by applying a series of marginal external factors to capture the benefit (mostly) of removing passengers from travelling on the road network, as described from paragraph 7.18 above. This is calculated using abstraction rates from the additional rail passenger demand at a network level, in terms of passenger miles. Table 7.12 summarises the results expressed above in terms of additional rail passenger miles for this purpose and therefore follows the same pattern as the equivalents for demand and revenue.

Table 7.13: Overall domestic route passenger miles changes by journey purpose (millions, 2019 levels)

Passenger miles increment (millions)	Business	Commuting	Leisure	Total
HS and other South Eastern services	38.3	117.1	45.6	201.1
Other services	4.4	11.2	5.2	20.8
Total GB rail	**42.7**	**128.3**	**50.9**	**221.8**

Source: Steer analysis of MOIRA 2.2 modelling

Operating cost analysis

7.70 The difference in operating costs between the Counterfactual and the Outturn Scenarios has been calculated using a set of operating cost models developed for this work.

7.71 The cost items calculated fall into one of the following categories.

- Rolling stock lease costs
- Rolling stock maintenance costs
- Staff costs
- Electricity/fuel costs
- Track Access Charges.

7.72 The costs for operating a rail service on the classic rail network differ significantly from the costs of operating a service on HS1 due to the different charging mechanisms.

Classic network rail access charges

7.73 Classic access charges are split into three categories:

- **Infrastructure cost charges,** which recover a proportion of the fixed costs of rail infrastructure, i.e. costs which do not vary with network use in the short-term

- **Variable charges**, which recover costs that are directly incurred by Network Rail when train services are operated over its network
- **Station charges**, which recover the costs of operating, maintaining and renewing the stations that are owned by Network Rail.

7.74 Only cost items which would change value significantly between the Counterfactual and the Outturn Scenarios have been modelled. The operating cost models for this study therefore primarily pick up the changes to the variable charges. Operating cost items which are not expected to change between the Counterfactual and Outturn Scenarios and have therefore not been modelled include:

- **Network Rail fixed track access charges:** these charges are fixed charges payable from franchised TOCs to Network Rail and are not dependent on the number of train services operated
- **Classic station access charges:** train operators pay a station long-term charge for maintenance, renewal and repair costs for stations owned by Network Rail and a qualifying expenditure charge for day-to-day running costs of providing services and amenities at managed stations
- **Electrification Asset Usage Charge:** this amounts to a much smaller magnitude of cost compared with other track access charges and for the sake of simplicity has therefore been omitted.

HS1 operating costs

7.75 HS1 operating costs are divided into the following three components:

- **Investment Recovery Charge:** this is intended to recover the long-term capital costs of the HS1 project, and the value is fixed for the duration of the HS1 Concession. It is applicable to the chargeable journey time spent on the HS1 route and does not incorporate any time scheduled for stopping at a station.
- **Additional Investment Recovery Charge:** this is designed to recover the cost of enhancements to route infrastructure not covered through the renewals process and is determined by calculating the efficient costs of carrying out the enhancement, including the cost of finance, over the lifetime of each asset. It is applicable to the chargeable journey time spent on the HS1 route and does not incorporate any time scheduled for stopping at a station.
- **Operation Maintenance and Renewal Charge:** this is to recover the operations, maintenance and renewal costs of HS1, excluding station costs. It includes a fixed and a variable element. The fixed element refers to costs that are directly incurred due to the train operation, while the variable element refers to other long-term operational costs. It is applicable to the chargeable journey time spent on the HS1 route.

This study

7.76 Operating cost items calculated for this study, and how they differ in the Counterfactual Scenario compared with the Outturn Scenario, are shown in Figure 7.7.

Figure 7.7: Operating cost modelling approach for Counterfactual and Outturn Scenarios

<table>
<tr><th>Category</th><th>Domestic High Speed Services</th><th>International Services</th><th>Domestic South Eastern Services</th><th>Domestic South Western Services</th></tr>
<tr><td>Rolling Stock Lease Costs</td><td>Services and associated Rolling Stock costs (All Class 395 sets) removed</td><td>Small change in costs modelled based on change in services frequency and Journey times</td><td colspan="2">No significant change</td></tr>
<tr><td>Rolling Stock Maintenance Costs</td><td rowspan="3">Services and associated costs removed</td><td colspan="3">Change in costs modelled based on change in vehicle miles</td></tr>
<tr><td>Staff Costs</td><td colspan="3">Change in costs modelled based on change in train hours</td></tr>
<tr><td>Electricity/Fuel Costs</td><td colspan="3">Change in costs modelled based on change in vehicle miles</td></tr>
<tr><td>NR Fixed Track Access Charges</td><td colspan="4">No significant change in costs, not modelled</td></tr>
<tr><td>NR Variable Track Access Charges</td><td rowspan="2">Services and associated costs removed</td><td>Increase in NR Access charges for operating on classic network</td><td colspan="2">Change in costs modelled based on change in vehicle miles</td></tr>
<tr><td>HS1 Station Access Charges</td><td rowspan="2">HS1 costs removed but conventional costs added therefore no significant change</td><td colspan="2">Not Applicable</td></tr>
<tr><td>Conventional Station Access Charges</td><td>Service removed but no significant change in cost</td><td colspan="2">No significant change in costs</td></tr>
<tr><td>HS1 Station Access Charges</td><td>Services and associated costs removed</td><td>Services moved to classic lines – HS1 costs removed</td><td colspan="2">Not Applicable</td></tr>
</table>

Source: Steer

7.77 Changes in operating costs for South Western services have been excluded from the analysis. Without capital costs for the redevelopment of Waterloo International station and its subsequent reopening for South Western domestic passenger service use, it is not possible to include the benefits and costs resulting from that change in the appraisal, therefore operating costs have not been modelled.

7.78 Key changes in costs modelled include:

- Change in rolling stock lease costs. In particular the cost of the Class 395 fleet for operating the domestic high-speed services which operate in the Outturn Scenario but not in the Counterfactual
- Change in rolling stock maintenance costs related to vehicle mileage operated
- Change in staff costs related to the number of train hours operated in each timetable
- Change in electricity costs related to vehicle mileage operated
- Change in conventional and HS1 track access charges between the Counterfactual and Outturn Scenarios.

7.79 The full cost of procuring and operating the Class 395 fleet is removed from the Counterfactual Scenario as these units would not be required without HS1. The cost of procuring and

operating the Class 374 Eurostar fleet is retained in the Counterfactual Scenario. Whilst it is noted that the Class 374 units are technically not compatible with operating on the classic network, we assume the primary reason for procuring these units was to replace life-expired class 373 units, therefore under the Counterfactual Scenario new rolling stock would also have been procured, albeit to a different specification. It has been considered that procuring new rolling stock capable of operating on the classic network could have been more expensive than procuring the Class 374, although it is difficult to quantify this effect reliably and so it has not been modelled.

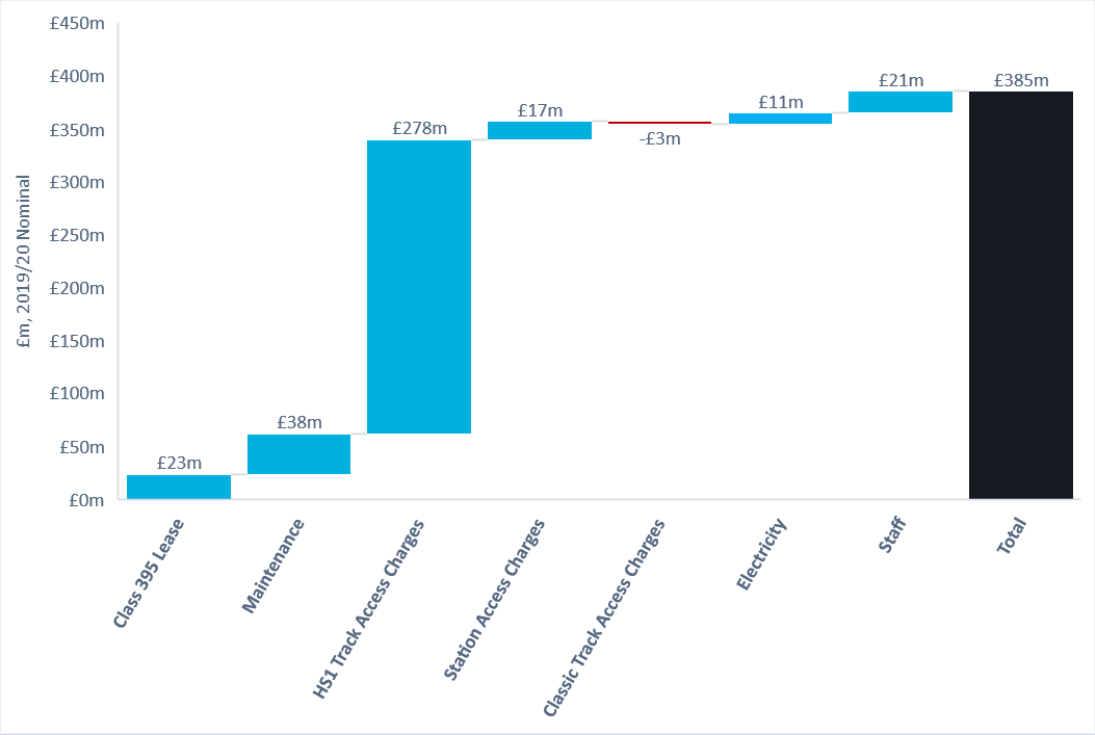
7.80 More detail on the modelling of operating costs is provided in Appendix G.

Results

Single Year 2019/20

7.81 The Outturn service costs £385m per annum more than the Counterfactual to operate. This is primarily due to the track access charges for HS1 being much higher than the variable track access charges payable to Network Rail for using the classic network.

Figure 7.8: Single Year cost Difference between Counterfactual and Outturn (2019/20 Nominal)



Note: A positive value represents an increase in the Outturn compared with the Counterfactual
Source: Steer analysis

7.82 The key differences are:

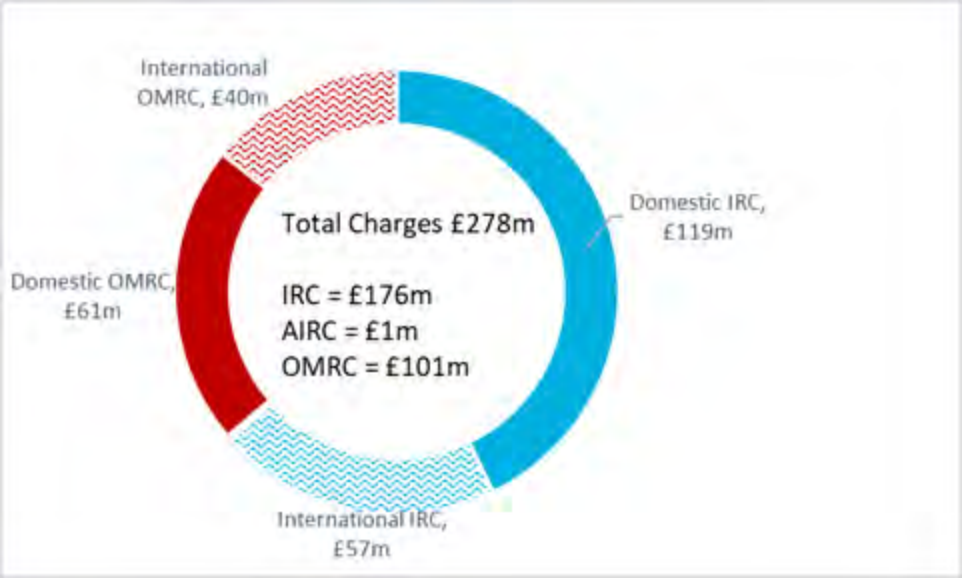
- +£23m for Class 395 lease costs
- We have assumed all 29 Class 395 sets are not required in the Counterfactual.
- We have also assumed no increase or decrease in conventional rolling stock numbers
- +£38m rolling stock maintenance as more vehicle miles are operated
- +£278m in HS1 track access charges

- +17m station access charges
- -£3m in Network Rail track access charges
- +£11m in electricity charges as more vehicle miles operated
- +£21m in staff costs as more train hours operated.

7.83 The HS1 track access charges consist of:

- Investment recovery charge: £176m
- Additional investment recovery charge: £1m
- Operations, maintenance and renewal charge: £101m.

Figure 7.9: HS1 Track Access Charges (2019/20 Nominal)



Source: Steer analysis

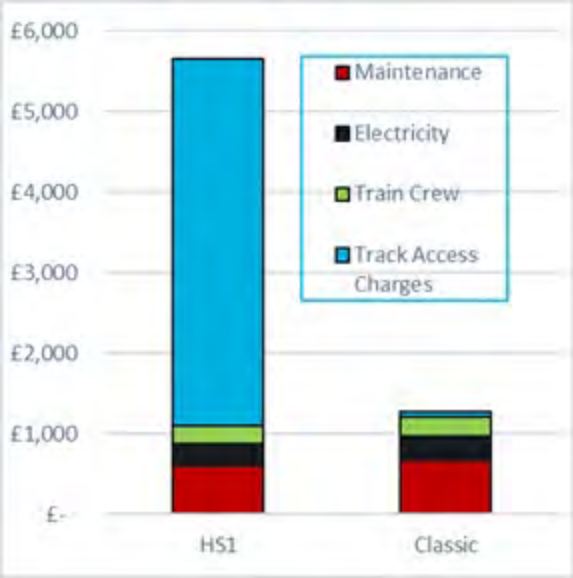
Comparison of HS1 and Network Rail charging regimes

7.84 A comparison of HS1 and Network Rail charging regimes has been undertaken to highlight the difference in operating costs. The significant difference is because the HS1 concession's costs are entirely funded through the access charges. Network Rail's overall costs are not just covered by the variable track access charges calculated here, they are also funded through direct government grant and fixed track access charges paid by the franchised TOCs. South Eastern, for example, paid £74m in fixed track access charges to Network Rail in 2019.

7.85 A comparison for a single journey is shown below between:

- a 12-car Class 375 operating from London Victoria to Ashford on the classic network, compared with:
- a 12-car Class 395 operating from London St. Pancras to Ashford via HS1.

Figure 7.10: Comparison of HS1 and Network Rail Track Access Charges



Source: Steer analysis

7.86 On HS1 access charges costs around £5,000 for a single trip. This is significantly higher than the marginal variable usage charges paid to Network Rail to access non-high- speed infrastructure. On Network Rail classic lines access charges cost around £1,000 for a single trip. This is significantly higher than the marginal variable usage charges paid to Network Rail to access non-high- speed infrastructure.

8 Monetised evaluation of benefits and costs

Introduction

8.1 As part of this evaluation, we have taken the opportunity to reassess the ex post cost benefit analysis (CBA) that formed part of the first evaluation. This has taken the current assessment of transport benefits experienced by rail users and non-users, along with the estimate of incremental uplift in operating costs (as set out in Chapter 7), the outturn implementation costs and estimates of past and future maintenance and renewal costs to derive an ex post BCR. Throughout, this CBA has sought to capture and quantify HS1's impacts and costs using the approaches outlined in TAG. This assessment does not include the full range of impacts which might be captured in an ex ante Value for Money assessment, such a dynamic agglomeration impacts.[28]

8.2 The CBA reported in this Chapter considers the benefits and costs associated with international and domestic high-speed services and consequent changes to the wider South Eastern franchise network. It does not include the benefits and costs associated with the repurposing of the international platforms at Waterloo for South Western franchise services. While these benefits and costs are sizeable, they are not included in the cost benefit analysis because:

- The repurposing of the international platforms at Waterloo was part of a wider programme of enhancements at the station. Furthermore, the benefits realised from the repurposing of the platforms rely on wider enhancements to the South Western lines. While it is possible to identify the benefits felt by users by comparing the Outturn Scenario with our Counterfactual Scenario, it has not been possible to identify a fully defined set of costs associated with these benefits.
- The decision to repurpose the platforms and how they were to be reconfigured was taken independently from the decisions to proceed with HS1. While the reconfiguration of the platforms and the benefits that come from this could not have taken place without HS1 being built, the decision that the international platforms were repurposed for domestic services and then the exact nature of the works and hence scale of benefits that comes from these is independent of HS1 and was subject to a freestanding business case.

8.3 While HS1 is used by some freight services, this use is small compared with the line's use by international and domestic passenger services and the economic benefits that arise from freight traffic are therefore likely to be comparatively small in relation to domestic and

[28] DfT (2017) Value for Money Framework

international passenger benefits. As a consequence, the benefits of these freight services have not been valued within the ex post CBA.

8.4 When considering the CBA, it is important to recall that this is an economic CBA and not a financial assessment. An economic CBA is undertaken independently of perspective and seeks to capture the costs and benefits incurred by society as a whole, unlike a financial assessment where perspective is material, that is different actors (government, train operating companies, the concession holder etc.) have different financial goals and objectives and each would judge financial impacts from their own viewpoint. Furthermore, an economic CBA considers welfare. This is in contrast to a financial assessment which only focuses on revenues and monetary costs. The funding and financing of HS1 has been considered previously and is not part of the scope of this evaluation.

8.5 Furthermore, an economic CBA considers the 'net national' welfare impacts of an intervention and compares these with the net national costs. It is possible for there to be positive local effects, but if these are a result of displacement of economic activity from elsewhere within the UK, it could be the case that the net national impacts are somewhat less than a place-based assessment alone would suggest. We have looked at local place-based impacts at some length in Chapters 4, 5 and 6. Foreign direct investment (FDI) is a net gain to the UK economy, but there is insufficient data to allow the question of whether and to what extent HS1 has attracted FDI to Kent to be investigated. The impacts of HS1 on the area surrounding St. Pancras International station has been considered in other evaluation work.

8.6 As per convention, the CBA looks at costs and benefits over a sixty-year period. As set out earlier in this report, MOIRA 2.2 has been used to assess the demand, revenue and benefit impacts of the Outturn Scenario compared with the Counterfactual Scenario. MOIRA 2.2 produces forecasts for financial years rather than calendar years. To minimise post-model processing, the first year of the CBA period is financial year 2010/11. Noting that HS1 domestic high-speed services commenced at the end of November 2009, this means that around four months of domestic revenue, benefits and operating costs are excluded from the CBA. Furthermore, international services experienced the benefits of Phase 1 of HS1 from September 2003 and the full benefits of HS1 from November 2007. International revenue uplift, benefits and operating costs before April 2010 are also not considered. Collectively, this means that the revenue, benefits and operating costs in the CBA are understated, but this understatement is not considered to be of a scale that would materially affect the findings of CBA, nor the conclusions that are drawn from the analysis.

8.7 Also, as per convention, all costs and benefits are expressed in a 2010 price base. They are expressed in present values with the discount year also 2010. Standard DfT TAG/Green Book parameters have been used for price base conversions and discounting.

8.8 The benefit calculations have been undertaken using the processes and procedures set out in the current edition of TAG, as well as parameters from the November 2021 TAG Databook. This means that as well as reflecting the differences between the Counterfactual and Outturn Scenarios, it takes a 2022 perspective on what benefits should be monetised and how this should be done.

8.9 HS1 has led to benefits to existing users of the railway, be they domestic or international passengers. The faster and more frequent services that HS1 has facilitated also result in more people using the railway than would otherwise be the case. These people also experience a benefit due to HS1 – they choose to use rail because the post-HS1 service is more beneficial to

them than whatever activity they would have done in the absence of the HS1-enabled rail services. Conventionally, these benefits to new rail users are captured using the 'rule of half' approach. New users also lead to additional rail revenue over and above the Counterfactual Scenario.

8.10 In the CBA, the monetised benefits of HS1 comprise:

- User benefits
- Non-user benefits
- Other monetised benefits
- Wider economic impacts (Level 2 impacts comprising static agglomeration, labour supply and output change in imperfectly competitive markets).

8.11 Costs used in the cost benefit analysis comprise:

- Capital (implementation) costs
- Maintenance and renewal costs
- Operating costs.

8.12 It should also be noted that inherent to the conventional approach to CBA as used by DfT is an assumption that the intervention under consideration does not lead to changes in the scale and pattern of population and economic activity other than at the margin, that is it is assumed that the intervention does not change the pattern of land use, the distribution of population or the nature of the economies affected by it. The analysis presented earlier in this report suggest that there is evidence that some areas served by HS1 have experienced land-use changes at a greater rate than comparator locations, which supports the hypothesis that there is a causal link with the provision of HS1 services. However, whether the conventional approach leads to an under- or over-statement of benefit is unresolved, with the potential that the answer may be context specific.

8.13 Cost benefit analysis practice has developed and evolved since the original ex ante appraisal that informed the decisions to proceed with the implementation of HS1, and also since the initial appraisal. This makes it challenging to compare directly the BCRs derived by this CBA with those of earlier assessments. However, the calculated BCRs are intended to be consistent with other contemporary ex ante appraisals and ex post evaluations.

8.14 Before setting out the findings of the CBA, each source of benefits and costs is considered below.

User Benefits

8.15 User benefits are the benefits felt by users of the international and domestic services that use HS1. These benefits come about because of the reduction in GJT that users experience relative to the Counterfactual Scenario. To a degree, these benefits are offset by some users paying higher fares than they would have in the absence of HS1 – in cost benefit terms, this is a 'user charge' impact.

8.16 User benefits also include the benefits felt by users of the 'classic' network where there have been timetable changes to make use of the capacity released by international services using the dedicated high-speed line and the transfer of the London terminus from Waterloo Station to St. Pancras International station. These benefits come about because rail users experience shorter journey times and more frequent services and because greater on-train capacity leads to lower levels of crowding.

8.17 Treasury Green Book guidance is that normally CBA should only consider benefits accruing to UK residents, but the journey time reductions experienced by international services that have come about due to HS1 leads to benefits to both UK and non-UK residents. For this CBA, we have included benefits to both UK and non-UK residents. This is for the pragmatic reason that to identify benefits to users of international services by UK and non-UK residents separately would require data on the split by residence and by journey purpose and this was not available.[29] A sensitivity test has been undertaken to explore how the BCR changes with respect to this assumption and this is reported later in this chapter. It is also noted here that there are no available values of time for non-UK residents, and it has therefore been assumed that UK and non-UK residents have the same values of time.

8.18 It is also noted that the government's stated objectives for HS1 included increasing the capacity for international services and reducing the journey times from London to the Channel Tunnel (see paragraph 2.6). On the basis that the purpose of a CBA is to contribute to an assessment of whether an investment is value for money, it would be appropriate to identify all the benefits associated with the stated objective, as even if they then do not form part of a stated BCR they may inform any assessment of value for money.

8.19 Users also benefit from more punctual journeys. As set out in Chapter 7, while the available evidence is that post HS1's completion there has been an improvement to the punctuality of South Eastern franchise services, this impact is relatively modest. A high-level assessment suggested that the monetised benefits of this punctuality improvement were likely to be immaterial when compared with the journey time, frequency and user charge impacts. On this basis, no further detailed work has been undertaken to allow punctuality impacts to be included in the CBA. As well as reducing journey times, HS1 is considered to have led to more reliable international journeys. As data is not available on international service reliability before the opening of HS1 or what that reliability would be in the Counterfactual Scenario, it has not been possible to make an assessment of the scale of this benefit.

8.20 A simplifying assumption has been made that the access and egress journey to and from railway stations has the same time and cost characteristics in the Outturn and Counterfactual Scenarios. The relocation of international passenger services to St. Pancras International station along with the introduction of domestic high-speed services will have changed the access and egress times for people at the London end of the route, so in effect what we have assumed is that the disbenefits to people who have a longer access or egress journey is offset by people who benefit from a shorter journey. Because of the more attractive journey times and higher frequency offered by high-speed domestic services, as well as the availability of car parking, some people will choose to use Ebbsfleet International or Ashford International instead of using a local station served by alternative train services (including station served by high-speed domestic services). To a degree this longer access journey will offset some of the benefits due to the faster and more frequent journeys. This has not been taken into account in the CBA, nor has any impact of additional vehicle kilometres from people who choose to drive to a more distant station than they would have in the Counterfactual Scenario. On this basis, the user and non-user benefits in the analysis are uncertain and may under- or overstate the impact.

[29] TAG does not provide guidance on the CBA of international rail services, but the approach set out here is consistent with the approach applied to the CBA of aviation interventions – see paragraph 3.2.9 of TAG Unit A5.2.

8.21 As set out in Chapter 7, the impact of the transfer of international passenger services to HS1 and St. Pancras International station has been assessed using a bespoke spreadsheet model. For domestic services the differences between Counterfactual and Outturn demand, revenue and benefits has been assessed using MOIRA 2.2.

Non-user benefits

8.22 A proportion of new rail users would have otherwise undertaken their journey by car. Transfer from car to rail leads to there being fewer cars on the roads, which in turn leads to lower levels of congestion and fewer road traffic incidents. The benefits of this have been captured by applying DfT's Marginal External Cost approach. An assumption has been made on the proportion of new users who transfer from car and this assumption is taken from DfT's TAG suite of guidance.

8.23 Fewer cars on the roads has an indirect tax impact on government as less traffic means less fuel is used, which in turn means less tax is collected. Standard TAG approaches have been applied to calculate this impact.

8.24 Reflecting the unattractiveness of car travel to and from central London, evidence from the first evaluation is that the proportion of new users who transfer from car is lower than the TAG assumption. Nonetheless, the TAG assumption has been adopted in the CBA. This means that the non-user benefits are likely to be overstated. However, as these make up only a small proportion of the benefit stream this is not considered to have any material impact on the findings of the analysis, or the conclusions drawn.

8.25 It has been assumed that car travel is not an alternative to international high-speed services. Transfer from road to rail has been assumed only to be an impact associated with domestic high-speed services and wider changes to South Eastern franchise services.

Other monetised benefits

8.26 Compared with the Counterfactual Scenario, the Outturn Scenario leads to carbon impacts due to:

- International services attracting passengers who would otherwise have travelled by air leading to a lower level of air services between London and Paris and London and Brussels
- Domestic high-speed services and enhanced South Eastern franchise services attracting people who would otherwise have travelled by car
- Additional electricity consumption due to additional train miles. A proportion of the electricity used is generated by carbon emitting sources.

8.27 Carbon emissions fall into either the 'traded' or 'non-traded' sectors of the economy. In the traded sector primary carbon emitters purchase permits to emit carbon. Carbon emissions from power generation and aviation are part of the traded sector, which means that the reduction in aviation emissions and increases in rail electricity consumption are both part of the traded sector. Positive and negative carbon impacts are internalised with the price paid to travel by air and purchase electricity. As a consequence, current convention is that monetised carbon impacts from the traded sector are not included within a CBA. While recent guidance from BEIS is that CBAs should be extended to include traded carbon at the same value as non-traded carbon (net of the traded UK Emission Trading Scheme price), this has yet to be adopted by DfT as part of its TAG suite of guidance. The adoption of the new BEIS approach would increase the monetary benefits associated with HS1. A sensitivity test has been undertaken to identify how adoption of the BEIS approach affects the BCR.

8.28 At present the cost of carbon permits associated with electricity generation is included within rail operating costs. The adoption of the new BEIS guidance would suggest that a further carbon cost would need to be associated with the additional electricity consumption associated with domestic and international rail services. To an extent, this would offset the carbon benefit from a transfer of air passengers to rail.

8.29 The fuel purchased by car users is outside the traded sector, so transfer of car users to rail does lead to a monetised benefit. This is assessed using DfT's Marginal External Cost methodology.

8.30 Consistent with the approach set out in DfT's TAG the embedded carbon associated with the construction of HS1 is not considered in the CBA.

Revenue

8.31 Compared with the Counterfactual Scenario, the Outturn Scenario leads to:

- Additional revenue due to users of the HS1 domestic services who would otherwise have used the classic network paying a premium fare
- The HS1 domestic services attracting new users to the railway
- Enhancements to classic railway services attracting new users to the railway.

8.32 As HS1 domestic services and classic rail services are part of the South Eastern franchise, each of the above affects public sector revenues.

8.33 The uplift in international passengers between the Counterfactual and Outturn Scenarios leads to an increase in revenue for these services. In a CBA, this is considered to be private sector revenue, which is a benefit. In contrast with domestic revenue, there is no mechanism to isolate precisely the impact of faster international services on growth from more general market trends, which means these two effects cannot be differentiated. This means there is a particular degree of uncertainty with this benefit.

Wider economic impacts

8.34 The introduction of domestic high-speed services and changes to other South Eastern franchise services has the potential to generate wider economic impacts. The principal wider economic impact is agglomeration, which comes about from increasing the 'effective density' of an economy. Effective density is increased by an intervention – in this case an improved rail service – by bringing businesses and their labour markets and businesses and their suppliers and collaborators, in effect, closer together, which in turn leads to efficiencies and an economic gain greater than is captured through time savings alone.

8.35 DfT's TAG suite of guidance defines 'static' agglomeration as the agglomerative effect that comes about assuming no changes to the scale or spatial patterns or structure of population and employment other than at the margin. Alongside static agglomeration, transport interventions can also lead to labour supply impacts and output changes in imperfectly competitive markets. Labour supply impacts are the movement of individuals between the labour market and economic inactivity, while output change in imperfectly competitive markets impacts reflect the fact that in the presence of market power, changes in the level of economic activity generate additional value in excess of the initial transport generalised cost reductions.

8.36 TAG offers methods to calculate the scale of these impacts and states that these benefits can be added to an 'initial' BCR to calculate an 'adjusted' BCR. The differentiation between that

initial and adjusted BCR reflects the view that there is lower analytical certainty associated with these calculations when compared with user and non-user impacts, with user impacts being those impacts felt by users of the rail network (both high-speed and conventional) and non-user impacts being those experienced by others. An example of the latter would be changed congestion on the road network. An assessment has been made of static agglomeration and this has been used to calculate an adjusted BCR.

8.37 The wider economic impacts of static agglomeration, imperfect competition and tax revenue from labour supply impacts have been calculated following guidance and formulae in TAG Units A2.4 (Appraisal of productivity impacts), A2.2 (Appraisal of induced investment impacts) and A2.3 (Employment effects), respectively.

8.38 The main inputs for these calculations are transport demand and generalised travel costs by all modes. Car, other public transport and active modes data is needed in additional to data on rail demand and generalised travel time. Calculations have been made at a local authority district level, which means data has to be aggregated. For these calculations, demand has been derived from Census journey to work data and TEMPRO trip end data for all modes, overall demand has been kept constant between Counterfactual and Outturn Scenarios and mode shares have been adjusted to reflect the higher proportion of travel by rail in the Outturn Scenario. Generalised travel costs for car, public transport and active modes have been derived with high-level assumptions on distance, speed, and other non-time costs (e.g. vehicle or fare costs). Rail generalised costs have been derived from modelled journey times in MOIRA2.2 and high-level assumptions on fares. The change in journey times between Counterfactual and Outturn Scenarios was only considered for trips within Kent and between Kent and London. The calculations also use input economic data related to employment, GDP, earnings and productivity from the TAG Wider Impacts dataset and as such they are consistent with the assessment that would be made as part of an ex ante appraisal if done today.

8.39 DfT goes on to define 'dynamic' agglomeration, which is when a transport intervention induces a change to the patterns and scale of population or employment. The Treasury defines a transformational change as "a radical permanent qualitative change in the subject being transformed, so that the subject when transformed has very different properties and behaves or operates in a different way".[30] The evidence presented in Chapters 4 and 5 would suggest that in some locations served by domestic high speed services these conditions may have been met. However, as such effects are highly uncertain and the modelling required to assess these impacts is beyond the scope of the present report, they are therefore not included in the analysis.

8.40 It is also noted that the area around St. Pancras International Station has experienced substantial redevelopment and regeneration in recent years and prima facie this could, in part, be a function of the enhanced domestic and international connectivity offered by HS1. Establishing the extent to which such impacts are additional to those reported here, and are attributable to HS1, is out of the defined scope for this work. Similarly, there has been development and regeneration in the environs of Stratford International station. For the same reasons, this too has not been considered.

[30] Paragraph A7.2 **HM Treasury (2022) The Green Book**

Capital costs

8.41 To produce a BCR, we have taken the capital costs of the construction of HS1 from the National Audit Office report on "The Completion and Sale of High Speed 1"[31]. This is the same approach as adopted by the first evaluation. We considered when money was spent to allow monies to be brought into a common price base.

8.42 The principal capital costs elements are:

- HS1 Phase 1 which provided the high-speed line between the Channel Tunnel and Southfleet Junction in Kent, with a connection to the classic network via Fawkham Junction. Construction of Phase 1 commenced in October 1998 and Phase 1 opened on 28th September 2003
- HS1 Phase 2 which completed the high-speed line to St. Pancras and includes St. Pancras Station. Construction of Phase 2 commenced in July 2001 and Phase 2 opened on 14th November 2007
- Station fit out costs at Stratford, Ebbsfleet and St. Pancras. For the purpose of the CBA, these cost have been taken to be incurred in 2007
- King's Cross St. Pancras Underground. As set out in the first evaluation, it was always the intention to redevelop the King's Cross St. Pancras Underground station but HS1 led to extra costs over and above what would have been incurred if HS1 had not have been built. The first evaluation stated that this additional cost was £675m. The redevelopment of the Underground station took place over a ten-year period from 2000 to 2009.
- The construction of HS1 led to the construction of a new depot at Temple Mills. This cost £375m with the spend being approved in November 2004 and the depot opening in October 2007.
- According to the National Audit Office, the sale of the HS1 concession in November 2010 led to a net receipt to government of £1,016m. This net receipt is the money received by government (£2,048m) less the costs incurred by government associated with the concession sale. These costs include the cost of sale itself as well as costs associated with debt write-offs, financial restructuring, etc. The concession is for 30 years which means that in 2040 a new concession will be let, and government will receive a further capital receipt. For the appraisal the central case assumption is that, when expressed in 2010 prices, this second concession payment will be the same as the money received by government in 2010.

8.43 A new depot was constructed to accommodate the Class 395 'Javelin' rolling stock for domestic high-speed services. Reflecting the lease arrangements for this fleet, which means recovery of depot costs is integral to the lease payment, the costs of this depot are excluded for the CBA but captured through the operating costs of the domestic high-speed services.

These cost items are summarised in Table 8.1. As these costs are outturn costs, there is no requirement to adjust costs to account for optimism bias.

[31] NAO (2012) The Completion and Sale of High Speed 1

Table 8.1: HS1 Capital Costs, values in nominal prices

Cost Item	Outturn Cost (£m)
HS1 Phase 1	£1,919
HS1 Phase 2	£3,778
Station Fit Out	£109
King's Cross St. Pancras Underground	£675
Temple Mills Depot	£357
Sale of HS1 Concession	(£1,016)
Total Cost (Outturn nominal)	**£5,822**

Source: National Audit Office, Steer analysis

8.44 For the CBA the following assumptions have been made for the costs on maintenance and renewal.

- For the classic network, the annual incremental change between the Outturn and Counterfactual Scenarios in Network Rail's spend on maintenance and renewal is equal to the annual incremental change in Variable Track Access Charge paid by the rail operators. This is a standard assumption in rail CBAs.
- For HS1, the annual maintenance and renewal spend is equal to the total annual Operations, Maintenance and Renewal Charge paid by the domestic and international operators (see below).

8.45 Within the CBA all costs and receipts are expressed in market prices.

Operating costs

8.46 Derived from the analysis described in Chapter 7, the incremental rail operating costs between the Outturn and Counterfactual Scenarios are shown in Table 8.2. As can be seen from the table, HS1 has led to an increase in rail operating costs.

Table 8.2: HS1 annual rail operating costs (nominal), values in 2021/22 prices

Cost items	Outturn Scenario vs. Counterfactual (£000s)
Capital lease	3,875
Non-capital lease	1,168
Maintenance	9,941
Track access charges	54,472
Electricity	1,803
Train crew	8,396
Total	**79,655**

Source: Steer analysis

8.47 As set out in Chapter 7, the track access charges for HS1 are made up of three principal components: the Investment Recovery Charge, the Additional Investment Recovery Charge and the Operations, Maintenance and Renewal Charge. The structure of these charges reflects the HS1 funding and financing strategy, but from an economic CBA perspective this is immaterial. What is material is that the train operating companies pay these charges as part of their operating cost.

8.48 It should be noted that the additional investment recovery charge has not been included as part of the operating cost in the CBA. This is because this charge is levied to pay for further enhancements to HS1 infrastructure. As the benefits that would arise due to these enhancements are not captured within the benefit stream it would not be correct to include the cost of securing these benefits as part of the overall costs of the Outturn Scenario.

8.49 In the case of the South Eastern franchise, should the incremental operating cost of the Outturn Scenario be greater than the incremental revenue, then the shortfall has to be met by the financial support the government provides to the franchise. This would be an additional public sector cost associated with HS1. In a situation where the incremental revenue exceeds the incremental operating cost, the surplus can be offset against other public sector costs.

Cost benefit analysis

8.50 To develop an estimate of the overall level of benefits in a common unit of account, all the benefits have been assessed in the modelled year (2019) in which we are comparing the Outturn and Counterfactual Scenarios. These have then been monetised and translated into a present value over a 60-year period, the standard period set out in the TAG and typically used in forward-looking ex ante appraisals as well as backward-looking ex post evaluations. The projection of benefits has been undertaken as follows:

- The passenger journey time and crowding benefits per passenger, in minutes, are assumed to remain consistent throughout the 60-year assessment period. This is likely to understate crowding benefits, which with all other things being equal would be expected to increase per passenger over time.
- Standard and premium domestic fares are assumed to grow at 1% above RPI each year until 2033 in line with DfT and industry assumptions; premium fare differential grows at the same rate; international fares grow in line with inflation.
- Demand growth is forecast using Passenger Demand Forecasting Handbook guidance for domestic services, while international growth is a continuation of the trend observed in recent years. In both cases growth is capped 20 years after the modelled year as per the TAG approach.[32]

Findings

8.51 In the paragraphs and tables that follow we set out the findings of the CBA. We do this by looking at each element of a TAG standard transport CBA before bringing together the assessment of costs and benefits to derive a BCR. By adopting the standard approach to setting out benefits and costs, this highlights both how HS1 has led to benefits, but also where HS1 does not have a monetised impact.

[32] It is noted that peer review of the first evaluation argued against use of demand cap for a completed scheme. However, since the completion of the first evaluation DfT's approach to applying a demand cap has modified such that rather than the demand cap being absolute (no further growth in demand past the cap year), the approach is to grow post-cap demand in line with population estimates. For this reason, it is considered that the objections in the peer review no longer stand and that the appropriate approach is to follow ex ante appraisal guidance.

Central case

8.52 The benefits of the Outturn Scenario compared with the Counterfactual are set out for:

- **Non-Business (Commuting) in Table 8.3**. It has been assumed that there is no commuting on international services, which means all these benefits accrue to users of the domestic high-speed services and the classic network. The travel time benefits are the benefits that come about due to a change in GJT, whereas the user charge captures the disbenefit of the domestic high-speed services premium fare.
- **Non-Business (Other) in Table 8.4**. Other users are people travelling for any other purpose than commuting or business. Domestic high speed, classic rail and international services all have other users. Domestic users incur a user charge impact, as well as travel time benefit.
- **Business in Table 8.5**. As well as benefits to people travelling for business purposes, this table also includes the benefits to private transport businesses, in this case the provider of international rail services. As well as time benefits and the user charge disbenefit, the table shows the Present Value of the incremental revenue and incremental operating costs between Outturn and Counterfactual Scenarios.

Table 8.3: Economic Efficiency of the Transport System – Non Business (Commuting)

Non-business: Commuting	£m PV
User benefits	
Travel time	824
Vehicle operating costs	0
User charges	-514
During Construction & Maintenance	0
Net Non-Business benefits: Commuting	**310**

Note: Values are expressed in 2010 prices and show present values over the evaluation period discounted to 2010
Source: Steer analysis

Table 8.4: Economic Efficiency of the Transport System – Non Business (Other)

Non-business: Other	£m PV
User benefits	
Travel time	1,338
Vehicle operating costs	0
User charges	-86
During Construction & Maintenance	0
Net Non-Business benefits: Other	**1,252**

Note: Values are expressed in 2010 prices and show present values over the evaluation period discounted to 2010
Source: Steer analysis

Table 8.5: Economic Efficiency of the Transport System –Business

Business	£m PV
User benefits	
Travel time	3,363
Vehicle operating costs	0
User charges	-223
During Construction & Maintenance	0
Subtotal	3,140
Private sector provider impacts	
Revenue	6,885
Operating costs	-1,523
Investment costs	0
Grant/subsidy	0
Subtotal	5,362
Other business impacts	
Developer contributions	
Net Business Impact	**8,502**

Note: Values are expressed in 2010 prices and show present values over the evaluation period discounted to 2010
Source: Steer analysis

8.53 What these three tables show is that compared with the Counterfactual Scenario, the time savings and frequency enhancements that HS1 facilitates leads to a substantial benefit to Commuters, Other users and to Business users, with Business users having the largest share. This reflects that while Business users are a minority of all rail passengers, they have a high value of time. The tables also show that the private sector rail service provider experiences an increase in revenue greater than its increase in operating costs.

8.54 The Public Accounts table (Table 8.6) sets out the impacts on the public finances. As per convention, the South Eastern franchise is treated as a public sector provider, which means that the revenue line in the table is the Present Value of the incremental revenue that accrues to the South Eastern franchise (or successors) over the sixty year assessment period and the operating cost is the Present Value of the incremental operating cost over the same period. The investment cost is the Present Value of the capital cost of constructing HS1 and its ongoing maintenance and renewal offset to a degree by the proceeds of the concession sale. It also includes the incremental changes to the maintenance and renewal of the classic network. The table also shows an indirect tax revenue impact. This is the loss of tax revenue on fuel sales due to car users in the Counterfactual choosing to use rail in the Outturn Scenario.

Table 8.6: Public Accounts Table

	£m PV
Local Government Funding	
Revenue	0
Operating Costs	0
Investment Costs	0
Developer and Other Contributions	0
Grant/Subsidy Payments	0
NET IMPACT	0
Central Government Funding: Transport	0
Revenue	-2,286
Operating Costs	5,040
Investment Costs	10,749
Developer and Other Contributions	0
Grant/Subsidy Payments	0
NET IMPACT	13,504
Central Government Funding: Non-Transport	
Indirect Tax Revenues	1,472
TOTAL	
Broad Transport Budget	13,504
Wider Public Finances	1,472

Note: Values are expressed in 2010 prices and show present values over the evaluation period discounted to 2010
Source: Steer analysis

8.55 The benefits and costs are brought together in the Analysis of Monetised Costs and Benefits table (Table 8.7). As well as the benefits set out in the Transport Economic Efficiency tables, this also includes a number of other monetised benefits to non-users. These are related to the change in vehicle-kilometres on the road network, which can be seen from the table are small in scale when compared with the benefits to rail users. The ratio of the Present Value of Benefits (PVB) to Present Value of Costs (PVC) is the TAG BCR. It should be noted that this excludes wider impacts and is equivalent to the 'initial' BCR that is used as the starting point for an ex ante value for money assessment. We return to wider impacts below.

Table 8.7: Analysis of Monetised Costs and Benefits

	£m PV
Noise	0
Local Air Quality	1
Greenhouse Gases	77
Journey Quality	0
Physical Activity	0
Accidents	6
Economic Efficiency: Consumer Users (Commuting)	310
Economic Efficiency: Consumer Users (Other)	1,252
Economic Efficiency: Business Users and Providers	8,502
Wider Public Finances (Indirect Taxation Revenues)	-1,472
Present Value of Benefits	**8,608**
Broad Transport Budget	13,504
Present Value of Costs	**13,504**
OVERALL IMPACTS	
Net Present Value (==PVB-PVC)	**-4,897**
Benefit Cost Ratio (==PVB/PVC)	**0.64**

Note: Values are expressed in 2010 prices and show present values over the evaluation period discounted to 2010
Source: Steer analysis

8.56 As can be seen from Table 8.7, the initial BCR is 0.64. If this were an ex ante appraisal, such a BCR would suggest that the starting point for a value for money assessment is that HS1 has provided poor value for money.

8.57 Versions of the Transport Economic Efficiency, Public Accounts and Analysis of Monetised Costs and Benefits tables in the standard DfT format are provided in Appendix H.

Wider economic impacts

8.58 Wider economic impacts of static agglomeration, imperfect competition and tax revenue from labour supply impacts have been assessed to add a further £890m PV (2010 prices). This leads to an adjusted PVB of £9,497m and an adjusted BCR of 0.70. Dynamic impacts, i.e. changes in scale and distribution of population and economic activity have not been included in this assessment, though in an ex ante appraisal these would be assessed as part of a wider Value for Money assessment. Benefits that could not be reliably attributed to HS1, including from regeneration around London stations, were excluded from the scope, no assessment has been made of their potential impact on the value for money category.

Sensitivity tests

8.59 A number of sensitivity tests have been undertaken to explore the sensitivity of the calculated BCR to a number of input assumptions. The results of these sensitivity tests along with the central case are presented in Table 8.8.

Demand Cap

8.60 While the central case has a demand cap applied 20 years after the 2019 modelled year, TAG suggests that sensitivity tests should be undertaken with the demand cap at 10 years and at 30 years. The purpose of these tests is simply to explore the sensitivity of the BCR to the assumed demand cap year. What these tests show is that:

- With the demand cap at 10 years, the unadjusted BCR is reduced to 0.56 and the adjusted BCR to 0.62. This reduction reflects that a shorter period to the demand cap means that domestic and international high-speed patronage does not grow as fast as in the central case for years 11 to 20 post modelled year and that patronage is behind the central case trajectory for all years after the demand cap. This reduces both the PV of benefits and revenue.
- With the demand cap at 30 years, the unadjusted BCR increases to 0.70 and the adjusted BCR increases to 0.77. This reflects that there is stronger growth than in the central case for years 21 to 30 and that after year 30, rail patronage follows a higher trajectory than in the central case with a consequent impact on the PV of benefits and revenue.

8.61 These sensitivity tests show that the demand cap assumption should not have a material impact on any value for money assessment.

Concession Value

8.62 The concession for HS1 will be relet in 2040. Two sensitivity tests have been undertaken to explore the influence of the future concession value on the BCR:

- If the concession value is zero (i.e. government secures no payment for the future concession), then the BCR becomes 0.60 (0.66 adjusted)
- If the concession value is twice the value received in 2010, the BCR becomes 0.68 (0.75 adjusted).

8.63 What this sensitivity test shows is that the assumption on the concession resale value does not have a material impact on the assessed BCR.

International Rail Demand

8.64 Previous work from the National Audit Office as well as the first evaluation has identified that outturn international patronage is less than forecast. The reasons for this are complex and have not been considered as part of this work. Nonetheless, it is instructive to look at the sensitivity of the results of the CBA to international demand, revenue and benefits.

8.65 Two sensitivity tests have been undertaken:

- International demand, benefits and revenue at 50% greater than the central case. To reflect that such a step change in demand would also need more international services, operating costs are also increased by 50%
- International demand, benefits and revenue at 100% greater than the central case and international operating costs increased by the same amount.

8.66 The 50% test increases the BCR to 0.89 (0.96 adjusted) and the 100% test increases the BCR to 1.15 (1.22 adjusted).

8.67 While these tests are simplistic in that it is unlikely that demand, revenue, benefits and operating costs would increase at the same rate. Any increases in demand, revenue and benefits would need to be accommodated within the existing capacity of HS1 and additional operating costs would be incurred if such increases were to happen. Nonetheless, what these tests show is that the importance of international patronage to the assessed BCR. Should international demand increase at a rate faster than assumed in this assessment, for instance due to the opening of new routes or new entrants on existing routes stimulating the market, then it should be expected that the BCR would be greater than this work suggests.

UK Residents

8.68 As noted in paragraph 8.17, while the Green Book suggests only benefits to UK residents should be included in the CBA, we have included all the benefits associated with international travel. To test the sensitivity of the BCR to this position, we have undertaken a sensitivity where only half of the international benefits are included in the CBA, that is we are assuming that half of international passengers are UK residents and that UK and non-UK residents experience the same benefit per trip. In this test, we have assumed no change in the international revenue, that is all the revenue uplift can be associated with HS1 regardless of the residency of the passengers. In this test, the BCR is reduced to 0.54 (0.60 adjusted).

2014 Values of Time

8.69 As previously noted, since the first evaluation a number of changes have been made to TAG CBA assumptions. The most significant of these has been changes to the values of time that are applied to Business, Commuter and Other users, as well as the assumptions to how these values grow over time. The net effect of these changes has been to reduce the PV of user benefits.

8.70 To explore the sensitivity of the CBA to these changes, a sensitivity test has been undertaken using the values of time current when the first evaluation was undertaken. In this sensitivity test, the BCR increases to 0.73 (0.80 adjusted).[33]

8.71 There have been other changes to TAG parameters that affect the BCR. However, the changes to values of time are considered to be the most material change.

Domestic Operating Costs

8.72 The outcome of the CBA is a function of the benefits and costs associated with HS1 and the nature of the HS1 concession. As noted in Chapter 7, the operating cost incurred by domestic high-speed services are high compared with equivalent journeys on the Network Rail network. A finding of the central case CBA is that the PV of these domestic operating costs is greater than the PV of the increment in domestic revenue.

8.73 To explore the sensitivity of the CBA to domestic operating costs, a sensitivity test has been undertaken where the PV of domestic operating costs has been set to be equal to the PV of revenue increment. In this text the BCR increases to 0.80 (0.88 adjusted). What this shows is that the structure of the HS1 concession has an impact on the BCR. This test, however, should be treated as indicative as it is not possible to simply reduce domestic rail operating costs

[33] For this sensitivity test, values of time were taken from TAG Data Book v1.1, January 2014

without also considering how the on-going maintenance and renewal of the HS1 infrastructure would be funded. A reduction in the charges to domestic high-speed services would inevitably lead to an increase in costs elsewhere in the appraisal.

Carbon Benefits

8.74 As set out in paragraph 8.26 et seq., current practice is not to include traded carbon within a CBA, which means that lower carbon emissions due to fewer international travellers using air are not included within the CBA. However, as also noted while not yet part of TAG recent guidance from BEIS suggests that reductions in traded carbon can be considered a benefit.

8.75 To explore the potential impact of including traded carbon within the CBA two sensitivity tests have been undertaken where carbon savings due to there being fewer air travellers in the Outturn Scenario have been valued by:

- Applying a carbon price which is the difference between the traded and non-traded values. For this sensitivity, the non-traded carbon price is the central price taken from the TAG Databook. The traded price is the average UK Emission Trading Scheme price for 2021/22 and it has been assumed that this grows in line with the price for traded carbon. This is our interpretation of the approach set out in the most recent BEIS guidance, although whether this is how TAG will develop remains to be seen. This test returns a BCR of 0.69 (0.76 adjusted)
- Applying the high non-traded carbon price from the TAG Databook with no adjustment. This gives the highest possible monetised carbon impact. The BCR for this test is 0.74 (0.81 adjusted).

8.76 As noted earlier, no downward adjustment has been made to account for the carbon impacts of additional electricity assumption associated with the additional train services in the Outturn Scenario when compared with the Counterfactual.

Table 8.8: Cost Benefit Analysis – Sensitivity Tests

£000s 2010 NPV	Central Case	Demand cap at 10 years	Demand cap at 30 years	2040 concession resale value as zero	2040 concession resale value as 2x central case	International impacts 1.5x central central case	International impacts 2x central central case	International benefits 0.5x central central case	2014 Values of Time applied	Domestic opex PV = domestic revenue PV	International carbon benefits included - high scenario	International carbon benefits included - net scenario
Commuter GJT Benefits	754,216	661,452	829,161	754,216	754,216	754,216	754,216	754,216	587,830	754,216	754,216	754,216
Other GJT Benefits	1,268,227	1,134,627	1,377,219	1,268,227	1,268,227	1,533,777	1,799,327	1,002,677	1,917,090	1,268,227	1,268,227	1,268,227
Business GJT Benefits	3,363,133	3,036,407	3,631,206	3,363,133	3,363,133	4,442,555	5,521,977	2,283,711	4,293,462	3,363,133	3,363,133	3,363,133
Non User Benefits	154,365	136,627	167,475	154,365	154,365	154,365	154,365	154,365	154,365	154,365	154,365	154,365
User Charges - Existing Users	-771,678	-683,303	-848,090	-771,678	-771,678	-771,678	-771,678	-771,678	-869,816	-771,678	-771,678	-771,678
User Charges - New Users	-50,762	-44,948	-55,790	-50,762	-50,762	-50,762	-50,762	-50,762	-76,600	-50,762	-50,762	-50,762
Private Revenue	6,884,557	6,386,106	7,258,184	6,884,557	6,884,557	10,326,835	13,769,114	6,884,557	6,884,557	6,884,557	6,884,557	6,884,557
Private Operating Costs	-1,523,041	-1,523,041	-1,523,041	-1,523,041	-1,523,041	-2,284,562	-3,046,083	-1,523,041	-1,523,041	-1,523,041	-1,523,041	-1,523,041
Indirect Tax	-1,471,514	-1,350,792	-1,561,607	-1,471,514	-1,471,514	-2,021,121	-2,570,729	-1,471,514	-1,471,514	-1,471,514	-1,471,514	-1,471,514
International Carbon Benefits	0	0	0	0	0	0	0	0	0	0	1,452,274	760,142
PVB	**8,607,504**	**7,753,136**	**9,274,716**	**8,607,504**	**8,607,504**	**12,083,626**	**15,559,748**	**7,262,532**	**9,896,333**	**8,607,504**	**10,059,778**	**9,367,646**
Public Operating Costs	5,040,445	5,040,445	5,040,445	5,040,445	5,040,445	5,040,445	5,040,445	5,040,445	5,040,445	2,285,707	5,040,445	5,040,445
Capital Costs	8,119,669	8,119,669	8,119,669	8,975,017	7,264,320	8,119,669	8,119,669	8,119,669	8,119,669	8,119,669	8,119,669	8,119,669
Renewal Costs	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669	2,629,669
Public Revenue	-2,285,707	-2,032,576	-2,472,587	-2,285,707	-2,285,707	-2,285,707	-2,285,707	-2,285,707	-2,285,707	-2,285,707	-2,285,707	-2,285,707
PVC	**13,504,077**	**13,757,207**	**13,317,196**	**14,359,425**	**12,648,728**	**13,504,077**	**13,504,077**	**13,504,077**	**13,504,077**	**10,749,338**	**13,504,077**	**13,504,077**
NPV	**-4,896,573**	**-6,004,071**	**-4,042,480**	**-5,751,921**	**-4,041,224**	**-1,420,451**	**2,055,671**	**-6,241,545**	**-3,607,744**	**-2,141,834**	**-3,444,299**	**-4,136,431**
BCR	**0.64**	**0.56**	**0.70**	**0.60**	**0.68**	**0.89**	**1.15**	**0.54**	**0.73**	**0.80**	**0.74**	**0.69**
Wider Economic Impacts	889,759	798,309	961,766	889,759	889,759	889,759	889,759	889,759	889,759	889,759	889,759	889,759
Adjusted PVB	**9,497,263**	**8,551,445**	**10,236,482**	**9,497,263**	**9,497,263**	**12,973,385**	**16,449,507**	**8,152,291**	**10,786,092**	**9,497,263**	**10,949,537**	**10,257,405**
PVC	**13,504,077**	**13,757,207**	**13,317,196**	**14,359,425**	**12,648,728**	**13,504,077**	**13,504,077**	**13,504,077**	**13,504,077**	**10,749,338**	**13,504,077**	**13,504,077**
Adjusted NPV	**-4,006,814**	**-5,205,762**	**-3,080,714**	**-4,862,162**	**-3,151,465**	**-530,692**	**2,945,430**	**-5,351,786**	**-2,717,985**	**-1,252,075**	**-2,554,540**	**-3,246,672**
Adjusted BCR	**0.70**	**0.62**	**0.77**	**0.66**	**0.75**	**0.96**	**1.22**	**0.60**	**0.80**	**0.88**	**0.81**	**0.76**

Source: Steer analysis

9 Discussion and conclusions

Introduction

9.1 This chapter summarises the findings from each element of the analysis and draws overall conclusions from the study. It highlights the socio-economic benefits experienced by the regions in Kent served by the domestic high-speed services, while noting that these vary significantly between different locations. These benefits have been identified through complementary trend analysis, econometric research and qualitative research based on stakeholder interviews. The analysis also identifies the transport benefits of HS1 for international and domestic users, principally journey time savings, demand and revenue growth and, for international services, a shift in modal share from air to rail, reducing CO_2 emissions. These are counterbalanced by the capital costs involved and increases in operating expenditure from the use of HS1. A monetised evaluation of benefits and costs has been undertaken based on the transport and wider economic impacts.

Changes in rail services due to HS1

9.2 HS1 has enabled shorter journey times to European cities from London, allowing rail to be more competitive against other modes, principally air. Services operating on HS1 to Paris and Brussels from St. Pancras International are around 30 minutes faster than pre-2003 services to and from Waterloo. An intermediate improvement in the service was in place between 2003 and 2007, with services using part of the HS1 line from the Channel Tunnel to Southfleet Junction in Kent, with a connection to the classic lines via Fawkham Junction, and still terminating at Waterloo.

9.3 The faster journey times between London and the Channel Tunnel have also enhanced international rail's competitive position vis-à-vis air, significantly increasing the rail modal share and reducing air traffic and hence CO_2 emissions. In conjunction with the extension of the European high-speed network, this has led to the extension of a number of Brussels services to Amsterdam.

9.4 With the launch of high-speed domestic services in 2009, HS1 has enabled domestic rail users in the South East to benefit from shorter journey times to and from London, with services consisting of two trains per hour London to Faversham using HS1 between St. Pancras International and Ebbsfleet International, one hourly train to Dover and one hourly train to Margate via Canterbury West. A fare premium is charged for journeys using the HS1 infrastructure compared with those exclusively on the classic rail network.

9.5 However, the journey time benefits between different locations served by high-speed services using HS1 vary significantly, with fastest journeys to London reducing by 55% (-28 minutes) from Gravesend and by 41% (-35 minutes) from Folkestone West, compared with a reduction of just 5% (-7 minutes) from Faversham and 10% (-4 minutes) from Chatham. Hence, different locations benefitting from HS1 are subject to very different levels of "treatment" or "dosage" in terms of the intervention, in this case the reduction in journey times. This has meant that

locations along the HS1 route have experienced its impacts differently and this is discussed below.

Socio-economic impacts

9.6 This section sets out the socio-economic impacts of the domestic rail services enabled by HS1. These were assessed using three complementary approaches:

- Analysis of trends in the socio-economic indicators in the localities affected by HS1-enabled high speed services
- Econometric analysis of the socio-economic impacts
- Qualitative analysis.

9.7 These approaches and the results obtained are described in the subsections below. We then draw overall conclusions from the three approaches, noting that the results are broadly complementary but highlight different aspects of the socio-economic impacts of HS1.

Socio-economic impacts trends observed

9.8 We have reviewed the socio-economic changes seen in locations served by domestic services using HS1 and compared these with the corresponding changes in the rest of Kent and the rest of the wider South East of England. We have looked at trends from 2005 to 2019 (or a shorter period where data a full time series was not available). This has allowed us to compare the situation before and after the introduction of domestic high-speed services.

9.9 Stations in Kent served by HS1 services were classified into 11 locations corresponding to stations or station groups: Ashford, Canterbury, Ebbsfleet, Folkestone & Dover, Gravesend, Maidstone, Medway, Rural Kent Coast, Sittingbourne & Faversham, Thanet, and Whitstable & Herne Bay. The stations that made up each station group had similar dosages, as well as their catchments being judged to have broadly similar socio-economic characteristics.

9.10 **Ashford** received a substantial improvement in journey times following the introduction of HS1. The population in Ashford increased by 13% from 2009 to 2019, more so than other areas in Kent and the South East. There was much faster growth (27%) in the area within walking distance of the station, which in conjunction with the increase in rail usage suggests that the rail service has been a factor in that growth. Employment growth, however, was around average for the region.

9.11 Journeys from **Canterbury** to London are faster than they were before HS1, but the station is still only served by one fast train an hour. Rail usage and population both grew faster than comparators, particularly from 2013 onwards. However, employment growth and growth in GVA per capita were both substantially below the average for the region.

9.12 Data for **Ebbsfleet** should be interpreted carefully: prior to the station opening it was not a clear residential centre, with the population centred in Dartford and Gravesend. The population and commercial floor space grew towards the end of the study period, following the announcement and start of construction of Ebbsfleet Garden City. Taking Ebbsfleet and nearby **Gravesend** together station usage doubled. However, there was only a slight increase in population compared with the rest of the South East, although GVA per capita did rise more rapidly that in the rest of the South East.

9.13 HS1 service to the stations at **Folkestone** and **Dover** improved journey times by around 35%, although the stations still only receive one fast train per hour. Rail usage has increased, with a particularly high increase in travel to Folkestone and Dover based on journeys originating in

London relative to the average in the South East. Population growth is in line with the regional trend, but employment dropped in 2012 and then remained flat, below the growth seen in other areas in Kent and the South East.

9.14 Travel to and from London to **Maidstone** was flat over the period studied. The population immediately around the station increased substantially over the study period, well above the average for Kent and the South East. but this was not reflected in the wider area, where growth was only slightly above average. This suggests that densification in the area around the station is happening, but that this is not linked to greater overall commuting by rail. Employment growth was below average, with most sectors shrinking over the period.

9.15 While there was a decrease in journey times from the **Medway Towns** stations to London, this was relatively small and has not been reflected by a growth in rail usage and it therefore seems unlikely that local socio-economic trends would be strongly linked to HS1. Population and employment growth were very similar to the regional average, with no clear trends.

9.16 Service quality to the **rural Kent Coast** (Deal, Martin Mill, Sandwich and Walmer) improved following the introduction of HS1 domestic services. Usage of the station increased above South East trends after 2015, but population and employment in the area both grew below the regional trend over this period of time, with the employment level decreasing by 8% from 2009 to 2019. **Sittingbourne** and **Faversham** showed no increase in overall rail travel, well below the average for the South East.

9.17 Rail usage of **Thanet** stations (Birchington-on-Sea, Broadstairs, Margate and Ramsgate) increased substantially from 2015 onwards. There was a particular increase in travel to Thanet from journeys originating in London: given the timing relative to the introduction of HS1 services, this is likely to reflect the increased popularity of the area as a visitor destination. The change in journey times from **Herne Bay** and **Whitstable** following HS1 was minimal. Overall growth in rail usage to the station was at the same level as the rest of the South East – travel from London did increase substantially from 2015 onwards. Primary qualitative research (Chapter 6) suggests that this reflects an increased popularity as a visitor destination.

Econometric analysis

9.18 The objective of the econometric analysis was to move beyond the trend analysis summarised above and test some key data metrics in a statistically sound way to try to identify the extent to which the areas and localities around the HS1 stations were positively affected by the enhanced connectivity offered by HS1 domestic rail services. It is therefore complementary to the descriptive analysis based on historical comparisons. The same 11 localities based on stations and station groups were used.

9.19 A two-pronged approach was used. In the first, the objective was to assess the broad socio-economic impacts of enhanced rail connectivity at the LAD level, by comparing the actual outcome with the results in a “synthetic” LAD with similar characteristics but without the HS1-supported rail services.

9.20 In the second, the analysis focused on the behaviour and performance of firms in each location, using data from the ONS IDBR, considering how firm performance and population has changed over time as a result of being located around, or locating at, an HS1-served station, compared with firms around non-served stations. In addition, it looked at how firm performance and population near HS1-served stations compares with that of firms around other stations at a given point in time.

9.21 The results of the econometric analysis were highly varied. For the district level results, the most consistent finding was that HS1 domestic services have played a significant role in growing the population in most of the districts served. All but one of those assessed are shown to have grown faster than their synthetic LAD comparators since the introduction of the service.

9.22 Local housing supply is likely to be a key factor when considering potential HS1 impacts on house prices in the areas served. Also house price inflation across the region affects the comparator areas. Nonetheless, over half of the HS1 districts tested registered a positive impact, with house prices growing faster than their comparators since the introduction of HS1 services.

9.23 Perhaps the most significant and challenging observed effect relates to the extent to which HS1 services have influenced local GDP and the role in this of the 'commuting effect' (people living in one place, but working elsewhere), which is also shown to be a likely influencing factor in the firm-level results. The finding is that local GDP in the areas served by HS1 domestic services has not grown as strongly as comparators.

9.24 The observed GDP effects are highly likely to be a result of the well documented economic 'pull' of London. This sees high wage and high-quality jobs draw workers from a large catchment area of which the home counties are a part. This commuting effect has the potential to limit local economic growth, depending on the extent of just how much of the local workforce travel out of the district to work. Equally, however, we are not looking at the London end of the route (as this is out of scope of the study), where the commuting from Kent will contribute to the growth in London GDP.

9.25 The principal means of countering this commuter effect is local economic growth and development that offers attractive employment opportunities locally. This has been achieved in other areas around London that have been able to develop regionally significant clusters of hi-tech and knowledge firms, corporate headquarters or sector specialisms. Examples are places such as St. Albans, Watford and Bracknell Forest.

9.26 However, Kent generally lacks these sorts of regionally significant clusters, and this is likely to be a factor where the firm performance results show underperformance relative to the comparator areas. For example, the percentage of local jobs in professional, scientific and technical sectors in Bracknell Forest is 15.3%, compared with 6.2% in both Ashford and Maidstone. Such clusters also play a key role in generating local firms and employment opportunities that counter the London commuter effect.

9.27 Consistent with this, greater wage differentials between London and Kent compared with between London and these sub-regional clusters, demonstrate the extent to which these clusters have been able to balance the pull effect of London jobs with more comparable wages. As is shown, in Kent we find a differential between local and inner London wages of 45%, compared to just 8% in Bracknell Forest of example. This means the financial incentive to work in London is much higher for Kent residents than Bracknell Forest residents, and that providing a quick and convenient means to access those jobs through HS1, adds a further, practical incentive.

9.28 In the HS1-served areas, the effect of drawing workers away will have been emphasised during the growth phase of HS1 passenger numbers, thus contributing to the comparative slower rate of local GDP growth. In the longer term however, given the population growth, and as passenger growth levels off, there should be the opportunity to attain stronger local economic

development, although this will need appropriate local policies and support, including accessibility to London offered by HS1. Indeed, there is already evidence of strong firm performance and growth in some of the northern HS1-served locations.

Qualitative analysis

9.29 Qualitative research was conducted with individuals from local government, businesses and business representative groups. This research was used to explore perceptions of the impacts of HS1 and gather a narrative account of the barriers and enablers to achieving impacts.

9.30 The approach to the stakeholder recruitment was to target those who could add depth and breadth to the study's insights. Interviews were undertaken with local government (Kent County Council, nine district councils and Ebbsfleet Development Corporation), business overarching groups (Kent Invicta Chamber of Commerce, Locate In Kent and Visit Kent) and a number of individual businesses affected by HS1.

9.31 HS1 is associated with positive impacts for a variety of different economic sectors. Interviewees explained that by better connecting Kent to London and (to a lesser extent) the continent in a fast, comfortable and reliable manner, HS1 allows businesses to combine a highly accessible location with relatively low property prices (compared to nearby London) and an attractive region for employees to live in. Some notable businesses have relocated to Kent or are considering location in Kent. Interviewees felt that many of these relocations would not have been considered without HS1.

9.32 Of all sectors, probably the most significant benefits have been to the tourism sector. Interviewees explained that HS1 brings more tourists into the region, in particular from London, and in general more affluent tourists. Couples tourism, wine tourism and sustainable tourism were all cited as being particularly bolstered by HS1. There are, however, some challenges which interviewees pointed to, such as around the cost of tickets, lack of evening and weekend services, and 'last mile' travel issues, which limit the scale of benefits that HS1 brings to the sector.

9.33 The arts and culture sector was perceived to have thrived in Kent over the last twenty years or so, with creative and digital hubs forming in towns such as Margate and Folkestone. HS1 was described by interviewees as a facilitator of this growth – allowing for relocations from East London, and contributing to the development of a reputation for a vibrant cultural scene. However, the extent of HS1's role in these changes is harder to ascertain. HS1 was not seen as a critical success factor by interviewees, but rather an additional factor which helped to support other drivers of growth.

9.34 In terms of demographic changes, interviewees described a transition towards a more 'London-like' population in areas that have seen population growth – with incoming populations generally younger, more affluent, and more likely to be of an ethnic minority than the existing population. Although there was some discussion of conflict between the views of incoming and established residents, with some interviewees pointing to a potential strain on local resources, these issues were not generally given much weight by interviewees, and we therefore conclude that there are not significant local concerns about sociodemographic changes at present.

9.35 The most apparent growth resulting from HS1 has been in Ashford, which has experienced both significant population growth and also development of new commercial spaces and opportunities in the areas adjacent to the station. Ashford's growth story is one of multiple

factors convening – a pro-growth local government strategy, an innovative and proactive approach to local planning (for example, the creation of a public-private partnership to develop a new commercial building), and the decision to locate the station in the centre of town.

9.36 Elsewhere, the impact of HS1 is less apparent – with various factors having hampered development. Interviewees identified that Ashford has been an 'early winner' of HS1, thanks to the combination of significant journey time improvements, a proactive local government and a clear and attractive proposition for business and residents. Elsewhere, without such a confluence of positive factors, interviewees suggest that benefits have not (yet) emerged to the same extent.

Overall conclusions for socio-economic impacts

9.37 The three strands of analysis described above provide different perspectives on the socio-economic impacts of HS1-enabled high-speed domestic services, but these are broadly complementary. All three strands indicate that there have been a diverse set of impacts across the region affected by HS1-enabled high-speed domestic services.

9.38 The area most clearly benefiting from HS1 has been Ashford, with significant population and housing growth, as well as new businesses being attracted to the town. Other areas (such as Canterbury) have also seen population growth and HS1 has helped to facilitate the arrival of new businesses. Inbound tourism has also been identified as a beneficiary in areas with suitable attractions, including in areas further from London where the time-saving benefit of HS1 is greatest, a position supported by observed increases in journeys originating in London to locations such as Thanet and Folkestone.

9.39 Historical trend analysis indicates significant population growth compared to comparators in the rest of Kent and the South East in only a few areas (particularly Ashford), but the econometric analysis indicates that high-speed services led to higher population growth in most areas served by HS1 than would have been the case without it (in other words, population growth would have been even lower without HS1).

9.40 Rail data shows an increase in commuting towards London from where there has been strong population growth. This is consistent with the limited employment and GVA growth in these areas indicated in both the trend and econometric analysis, implying that such commuters are earning their salaries elsewhere (in London in particular).

9.41 In some areas, such as Thanet and Folkestone, there have been significant increases in journeys originating in London towards HS1-served areas in Kent, which would be consistent with perceptions of increased levels of tourism noted by stakeholders. Stakeholders also noted an increased attraction for businesses in areas served by HS1.

9.42 While it is possible that increased levels of population and attraction for businesses will lead to greater economic activity (employment and GVA) over time, this has not yet been seen in the macro trends in historical data.

9.43 Overall, the impact of HS1 on rail demand has shown a benefit where there has been more co-ordination with housing supply and other local services, as in Ashford, compared with areas where, for diverse reasons, supply has been constrained, such as in Ebbsfleet. There are positive perceptions of HS1 in both local government and the business community, but the objective level of benefit to date only appears to reflect these perceptions in a few locations

Transport impacts

9.44 This section sets out "transport impacts" of the international and domestic high-speed services enabled by HS1, in particular the effects on passengers using services on HS1 as well as on other transport users such as passengers on conventional rail services and air passengers on the international routes. Benefits and incremental operating costs were assessed for both international and domestic high-speed services.

International benefits

Rail demand and revenue

9.45 International rail journeys between London St. Pancras International and Paris/Brussels (and other continental destinations) were improved by around 30 minutes through the use of HS1 infrastructure, when compared with the slower route on conventional lines to Waterloo used before 2003. This led to increased patronage on international rail services over and above the increase that would have been expected in the Counterfactual Scenario. This was due to international rail services capturing a larger share of the overall market. It is also expected that faster international rail services would induce some market growth over and above what would have occurred in any event.

9.46 The revenue associated with the increased international rail patronage is also an economic benefit of the HS1 scheme. However, it is not possible separately to identify the share of this which is associated with rail capturing a larger share of a growing Counterfactual Scenario market and what share is associated with induced demand. Nonetheless, it is expected that the former accounts for the bulk of the revenue uplift. The estimated international revenue improvement in 2019 due to HS1 was £238 million.

9.47 Similarly, it is possible to estimate aggregate journey time savings for Eurostar passengers as well as the change in rail's modal share in the London-Paris and London-Brussels markets, which has the effect of reducing emissions from air traffic (aircraft produce much higher CO_2 emissions per passenger km than trains).

Aggregate journey times savings

9.48 In the combined Paris and Brussels markets, rail's modal share (against air travel) rose from 59% in 2003 to 81% in 2010, corresponding to the period during which rail journey times were improved by around 30 minutes due to the use of HS1 infrastructure. Rail's market share stabilised thereafter. The aggregate journey time reduction due to the improved rail service was 274 million minutes in 2019, applying the full 30-minute reduction benefit to existing rail passengers and the "rule of a half" (hence a 15-minute saving) to those travellers switching from air to rail.

Emissions reductions

9.49 Due to reduced rail journey times, air traffic has fallen below what it would have otherwise been, reducing the number of aircraft seats flown. We estimated an annual saving in CO_2 emissions from 2010, which reached 145,000 tonnes by 2019.

Domestic benefits

Rail demand and revenue

9.50 On domestic routes, the 2019 timetable led to an additional 16.7 million passenger journeys on high-speed and other services, partially offset by a reduction of 9.1 million journeys on the

South Eastern franchise classic rail network leading to a net increase of 7.7 million journeys. Corresponding to these journey increases, there was an increase in rail revenues of £84 million when compared with the Counterfactual Scenario.

9.51 These figures take account of the fare premia applied to journeys using HS1, without which the incremental journeys would have been higher. Incremental journeys on high-speed services taking the fares premia into consideration were 15.8 million, whereas they would have been 16.5 million had no premium fares been applied (that is, a reduction in the journeys increment of 0.8 million journeys). The higher fares, despite the reduction in journeys increment, led to a higher revenue increment compared with the Counterfactual Scenario of £10 million in 2019.

Train performance

9.52 Train performance improved due to the use of more reliable HS1 infrastructure, but based on historical data the impact was small, reducing delays by an average of only 18 seconds per journey. This has therefore not been included in the monetised benefit calculations.

Aggregate journey time savings

9.53 Aggregate journey time savings in the 2019 Outturn Scenario compared with the Counterfactual Scenario were 514 million minutes, applying the "rule of a half" to additional journeys induced through the introduction of high-speed services. Of these savings, 418 million minutes were attributable to the high-speed services themselves, or to improvements to services on the South Eastern franchise classic network, and are therefore included in the monetised benefit calculations. The remaining journey time savings, such as those relating to the repurposed international platforms at Waterloo, are excluded for the monetised benefit calculations.

Crowding reduction

9.54 In addition to the journey time savings, we estimate a further 88 million minutes savings in aggregate "crowded minutes" on the national network, of which 47 million minutes related to the South Eastern franchise and are therefore included in the monetised benefit calculations.

9.55

User charges relating to fare premium

9.56 "User charges", which arise due to the fares premia for users of high speed services, but which are expressed in terms of aggregate minutes penalties for those using the services (based on users' values of time), were 130 million minutes lower in 2019 compared with the Counterfactual Scenario.

Non-user benefits

9.57 Non-user benefits (such as modal shift) are calculated from the incremental rail passenger miles operated. The assessment is that domestic high-speed services led to 222 million fewer vehicle miles in the 2019 Outturn Scenario when compared with the Counterfactual Scenario, with 201 million of these relating to the South Eastern franchise area.

Operating cost increases

9.58 The difference in operating costs between the Counterfactual and the Outturn Scenarios has been calculated using a set of operating cost models developed for this work. The cost items

calculated relate to rolling stock lease and maintenance costs, staff costs, electricity/fuel costs and track access charges. Due to different charging mechanisms, the costs for operating a rail service on the classic rail network differ significantly from the costs of operating a service on HS1with HS1 costs being greater, noting that the HS1 charges include an element of financing costs for the HS1 infrastructure.

9.59 Costs modelled covered both domestic and international services (for the part of their journeys in the UK only). For domestic services, the operating costs of the Class 395 rolling stock was included. For international services the cost of the new rolling stock (Class 374 replacing the original Class 373 units) was not included, as the change was considered to relate to the life-expiry of the older units rather than to the new infrastructure (although it is recognised that the Class 374 units cannot operate on the classic network).

9.60 The Outturn Scenario service operating costs for 2019 were £385 million higher than would have been the case for operating the Counterfactual Scenario. This is primarily due to the track access charges for HS1 being much higher than the variable track access charges payable to Network Rail for using the classic network, resulting in a cost increase of £278 million, which is over 70% of the total cost increment.

9.61 Splitting between international and domestic operating cost increases compared with the Counterfactual Scenario (in a single year), the international operating costs increase by £97 million (due to higher track access charges on HS1), while the domestic operating costs increase by £288 million (£180 million due to higher access charges on HS1, £61 million due operating the new rolling stock and £47 million due to other costs).

Monetised benefits and costs

Benefit-cost ratio

9.62 The transport impacts set out above have been used to undertake an ex post CBA of HS1. This CBA has been undertaken following the approaches set out in TAG. As is usual practice, the CBA considers a 60-year period from scheme opening, which for the purposes of the CBA has been taken to be the beginning of 2010/11 financial year.

9.63 Excluding wider economic impacts (which are primarily static agglomeration), what the CBA shows is that the monetised costs of HS1 exceed the monetised benefits. The 'initial' BCR is **0.64**. If this were an ex ante appraisal, that would suggest that the starting point for a value for money assessment is that HS1 provides poor value for money, although other factors would come into consideration before coming to a final view. This finding of the CBA is consistent with the findings of a comparable assessment made as part of the first evaluation.

9.64 The inclusion of wider economic impacts leads to an 'adjusted' BCR of **0.70.** While an increase on the initial BCR, if considered alone this BCR would also suggest poor value for money. That is, while assessed wider economic impacts add to the monetised benefits, they do not add sufficient additional benefits to change the value for money category. It is also noted that the assessed wider economic impacts are those which TAG states can be included in the adjusted BCR. These are primarily static agglomeration and also include labour supply impacts and output changes in imperfectly competitive markets. It is outside the scope of this report to assess regeneration around London stations, and dynamic agglomeration or the associated move to more or less productive jobs impacts, either in the areas of Kent served by domestic high-speed services, or in London.

9.65 There have been a number of changes to appraisal practice since the first evaluation was undertaken in 2014. The most significant of these is a change to the assumption of how values of time grow over time. A sensitivity test has been undertaken using the 2014 view on future values of time and while this return a higher initial BCR (0.73 compared with 0.64 using current values of time), this increase is not sufficient to change any conclusions drawn from the CBA.

Sensitivity tests

9.66 A number of further tests have been undertaken to explore the sensitivity of the BCR. These show that:

- the TAG demand cap assumption does not have a material impact on any value for money assessment
- the assumption on the 2040 concession resale value does not have a material impact on the assessed BCR
- should international demand increase at a rate faster than assumed in this assessment – for instance, due to the opening of new routes or new entrants on existing routes stimulating the market – then it should be expected that the BCR would be greater than this work suggests
- the inclusion within the BCR of benefits felt by overseas residents using international services increases the BCR, but not to an extent that different conclusions would be drawn in any value for money assessment if these trips were excluded
- in this case, including monetised carbon benefits due to fewer international air travellers has a benefit comparable in scale to wider economic impacts.

Learnings

9.67 While the privately-operated international services experienced a revenue uplift greater than the increase in operating costs, the incremental revenue gain on the franchised domestic services is less than the incremental increase in operating costs. The structure and scale of the charges to use HS1 means that it is more expensive to operate a train on HS1 than the classic network. This is a consequence of previous decisions on the structure and nature of the HS1 concession, which means that the charged to use HS1 include an element associated with the financing of the cost of building HS1. This means that the financial support from government to the South Eastern franchise has increased. In the CBA, financial support is treated as a cost to the public sector and so impairs the BCR.

9.68 In part, the cost of building HS1 is offset by the 2010 payment of the HS1 concession holder to the government. There is uncertainty about what sum the government will secure when the concession is re-let in 2040. Sensitivity tests have been used to explore the impact of alternative assumptions on the BCR and these show that the value received is unlikely to have a material impact on the ex post BCR.

9.69 The fact that there is a premium fare for using domestic high-speed services has several consequences. It means that patronage for these services is less than it would be if there were no premium fare, which in turn reduces user and non-user benefits. It also means that there is a user charge disbenefit, which again reduces the assessed benefits. However, the premium fare has an impact on revenue, and the price elasticity of rail travel is such that it should be expected that high-speed domestic revenue is higher with the premium fare than it would be without it.

9.70 It should be noted that the findings of the CBA are not independent of the decision to operate HS1 by a concession and the detail of how this concession has been constructed. The ex post BCR is a function of construction costs, the rail outputs that HS1 has allowed to be provided and the benefits that flow from these, *and* the approach to the concession. Alternative approaches to the funding and financing of the construction and then operation of the Channel Tunnel Rail Link would be likely to have had a material impact on the cost benefit appraisal and the resultant BCR.

9.71 When considering the findings of the CBA it should be noted that, as set out in the Treasury's Green Book and DfT's Value for Money Framework,[34] it is not proper to draw conclusions on value for money by considering a BCR in isolation. While the BCR is an important input, there are broader considerations about how well a scheme meets its objectives. There are impacts that have not been considered by this work. It is not within the scope of this evaluation to put forward an ex post value for money statement, but as set out in this report there are substantial and material place-based positive impacts of HS1 that would need to be taken into account should such an exercise be undertaken.

Conclusions

9.72 The government's stated objectives for HS1 were:

1. to more than double the capacity of four trains per hour (three in the evening peak) available for international passenger railway services between London and the Channel Tunnel
2. to reduce the journey time of those services between London and the Channel Tunnel by about half an hour to about 40 minutes
3. to provide greater capacity and reduced journey times for domestic passengers
4. to contribute to the regeneration of the Thames Gateway.

9.73 The theoretical capacity of HS1 is 20 trains per hour per direction,[35] much greater than the four train paths per hour that were available when international services operated from Waterloo. In practice, however capacity available for international services is less than this. Some HS1 capacity is used by domestic high-speed services. As well as taking up some available train paths, theoretical capacity is further reduced by the mixed use of HS1 by international and domestic services due to the two types of services having different stopping patterns and operating characteristics (acceleration, deceleration, maximum speed, etc.). Allowances for timetable perturbation also reduce the theoretical capacity. Nonetheless. the construction of HS1 has provided greater track capacity for international passenger services operating between London and the Channel Tunnel. However, as of 2019 not all of this capacity has been taken up. Should operators identify a market, there is scope for additional services to use HS1.

9.74 The journey time saving is around half an hour. The operation of high-speed international services between London and Paris, Brussels and other continental destinations, as well as the operation of high-speed domestic services between locations in Kent and London, has led to significant benefits for passengers in terms of journey time savings and reduced crowding. It has also led to an increased number of international journeys in both absolute and modal

[34] **DfT (2017) Value for Money Framework**

[35] NAO (2001) **The Channel Tunnel Rail Link: Report By The Comptroller And Auditor General HC 302in**

share terms and to an increased number of domestic journeys between Kent and London, with a corresponding increase in revenues for the domestic franchise operator.

9.75 In socio-economic terms, there have been clear benefits to certain locations served by the new domestic high-speed services, in particular in Ashford and, to a lesser extent, in Canterbury and other locations in East Kent. Businesses have been attracted to Kent by the faster services and inbound tourism has benefited, with more journeys to tourist locations originating from the London end of the route. However, in some locations, supply constraints have prevented increases in demand leading to a growth in population. Where population growth has taken place, it is largely associated with increased commuting to London, with the result that local economic indicators, such as GVA per capita, have not increased significantly compared with peer locations which do not benefit from HS1.

9.76 The impacts on the parts of Kent that fall in the Thames Gateway (Dartford, Gravesham, Medway and Swale) have been more modest. In general these areas have seen smaller journey time savings, and the premium fare for domestic services reduces the gain over the Counterfactual Scenario further. The first evaluation of HS1 identified a goal for high-speed domestic services to support the provision of up to 10,000 new homes in the vicinity of Ebbsfleet International station, of which only 300 had at that point been completed. By 2019, this figure had increased to 2,800 new homes. While this is a much greater figure, it is still short of the planned 10,000. However, the relatively faster rises in house prices in HS1-served areas show that demand does exceed supply and that there is still potential for HS1 to contribute to further redevelopment and regeneration in the Thames gateway, although it is noted that other local and national policies as well as the wider health of the national economy will also influence the rate and scale of development.

9.77 It has been well documented that the numbers of international passengers using HS1 are lower than was forecast when the construction of the Channel Tunnel Rail Link was first approved.[36] Greater passenger numbers would increase the benefits that HS1 brings to the country. There remains substantial unused capacity of HS1 and so potential for a future expansion of the international service offer which would be likely to lead to further economic benefits. The introduction of Amsterdam services in 2019 shows that there is operator and customer appetite for a greater range of destinations to be served by the international rail services it makes possible.

[36] For instance, see Booz & Co (2012) Review of HS1 Demand Forecasts

Appendices

A Logic map definitions

- **Outputs** are the different elements of HS1 that were delivered: new high speed rail services, station improvements, and associated changes made to the wider transport system to accommodate and complement the project (e.g. revised timetables, the relocation of existing services, etc).
- **1st order Outcomes** are elements of the changes to connectivity that HS1 delivers: in terms of stop-to-stop journey times, service frequencies, punctual and reliable journeys, service quality, etc.
- **2nd order Outcomes** refer to the short to medium term results of HS1. These come about because of the 1st order Outcomes and are typically achieved within the first 2 to 4 years. They may also reflect changes in transport behaviour as a result of HS1's 1st order Outcomes. An example of a 2nd order Outcome would be better linkages between jobseekers and the job opportunities that match their skills.
- **Long term impacts** refer to the eventual effects of investment on wider society and the economy, which could typically materialise after at least 4 to 5 years. These are hard to link directly back to any specific transport scheme as they are concurrently influenced by wider trends, other plans and policies, as well as other transport investment. Examples include how transport can help to support employment growth (through improving access to work opportunities), or reduce greenhouse gas emissions (through sustained modal shift).

B Data sources

Rail data

Rail demand data

MOIRA

- MOIRA 2.2 software license, including revenue and journeys matrix for year to March 2019 (Source: RDG).

RUDD

- Rail Usage and Drivers Dataset (RUDD) for stations and flows data (Source: DfT).

International services

- Eurostar passenger patronage data for 2019 and historical years back to 2002 i.e. pre-HS1 (Source: Eurostar), for each of the following services:
  - London – Paris
  - London – Brussels
  - London – Amsterdam.

Rail fares data

- Access to industry fares maintained by the Rail Delivery Group (RDG) is publicly available.[37] Steer is familiar with this data and regularly downloads and processes it to bring it into a more usable format. No data request is therefore needed.

Rail timetable data

Domestic 2019 rail timetable and operations data

- December 2019 Public Timetable for all services in study area in SPG format (likely to be included with MOIRA 2.2).
- December 2019 Working Timetable for all services in study area in PIF or CIF format.
- December 2019 Train formation data for South Eastern and South Western (Carriage working notices or Rolling stock diagrams).

Domestic 2017 rail timetable and operations data

- December 2017 Public Timetable for all services in study area in SPG format.
- December 2017 Working Timetable for all services in study area in PIF or CIF format.
- December 2017 Train formation data for South Eastern and South Western (Carriage working notices or Rolling stock diagrams).

[37] http://data.atoc.org/fares-data

Domestic 2008 rail timetable and operations data

- December 2008 Public Timetable for all services in study area in SPG format.
- December 2008 Working Timetable for all services in study area in PIF or CIF format.
- December 2008 Train formation data for South Eastern and South Western (Carriage working notices or Rolling stock diagrams).

Domestic 2005 rail timetable and operations data

- December 2005 Public Timetable for all services in study area in SPG format.
- December 2005 Working Timetable for all services in study area in PIF or CIF format.
- December 2005 Train formation data for South Eastern and South Western (Carriage working notices or Rolling stock diagrams).

Domestic 2005 rail timetable and operations data

- December 2001 Public Timetable for all services in study area in SPG format.
- December 2001 Working Timetable for all services in study area in PIF or CIF format.
- December 2001 Train formation data for South Eastern and South Western (Carriage working notices or Rolling stock diagrams).

International rail timetable data

- December 2019 Eurostar Public timetable in SPG format.
- December 2019 Eurostar Working timetable in PIF or CIF format.
- Pre 2007 Eurostar Public timetable e.g. December 2005 in SPG format.
- Pre 2007 Eurostar Working timetable e.g. December 2005 in PIF or CIF format.
- Pre 2003 Eurostar Public timetable e.g. December 2001 in SPG format.
- Pre 2003 Eurostar Working timetable e.g. December 2001 in PIF or CIF format.

Source: DfT to the extent available

Rail operating cost data

Conventional rail operating costs data

- Unit operating cost rates and rolling stock lease costs for conventional rail services, including:
  - Capital and/or non-capital lease charges.
  - Maintenance and materials cost per vehicle mile.
  - Vehicle Usage charge (VUC) per vehicle mile.
  - Diesel consumption rate per vehicle mile (where applicable)
  - Electricity consumption rate per vehicle mile.
- Above data required for each of the following rolling stock types:
  - South Eastern Class 375, 376, 377, 395, 465, 466 and 707.
  - South Western Class 159, 159, 450, 455, 458 and 707.
  - Eurostar Class 373 and Class 374.

Source: DfT / franchises

HS1 operating costs data

- Unit operating cost rates, including track access charges for HS1 (for domestic, international services and freight).

Source: DfT to the extent available, alternatively HS1

Eurostar Rolling stock capital and/or non-capital lease charges – Class 373 and Class 374

- The key data requirements and requests to conduct the analysis described above are listed below. The requests are set out by key "theme" below, covering:
  - data on businesses
  - rail demand data
  - rail timetable data
  - rail operating cost data.

Socio-economic data

Table B.1: Socio-economic data

Impacts	Dataset
Population change	• ONS mid-year population estimates (MSOA level or lower)
Employment change	• ONS Business Register and Employment Survey • data, including employment by industry and sector (Standard Industrial Classification) (MSOA level or lower).
Housing delivery	• HM Land Registry Price Paid dataset, with sell prices of all individual domestic properties from 1995, by property type. • Valuation Office Agency dwelling counts (MSOA level or lower), by built period, property type and Council Tax band. From 1993.
Commercial development	• Valuation Office Agency total commercial floorspace, number of properties and rateable value, by sector (MSOA level or lower). From 2001.
Demographic change	• MOSAIC population profile, at postcode level. • ONS data on household size and household classification by economic activity.
Commuting behaviour and employment change	• RUDD data on inbound and outbound commuting journeys, to/from London and destination served by HS1 domestic services. • NTS trip rate data for commuting trips, at a regional level. • MOSAIC employment and income data, at postcode level.
Business growth and Gross Value Added	• ONS GVA(B) data for small areas (MSOA). From 1998. • UK Business Structure Database, including employment and business data at firm level. Subject to a successful data request to DLUHC. • ONS Business Register and Employment Survey data on business counts (local units and enterprises), by employment size band and industry/sector (MSOA level).
Foreign Direct Investment	• ONS Foreign direct investment, experimental UK subnational estimates. Available at ITL1 level. Time series from 2015.
Tourism visits and spend	• Visit Britain local tourism data, including trips, stays and expenditure, at LAD level. From 2006. • Rail demand data on journeys from London to key tourist destination served by HS1.
Local land values	• HM Land Registry Price Paid data and Valuation Office Agency data, as described above.

C Socio-economic dashboards

C.1 This appendix shows the socio-economic dashboards, introduced from paragraph 4.31 in Chapter 4 above.

C.2 We have created "dashboards" for each of the 11 stations/stations groups with key indicators, including:

- Map of the "impact area" for the relevant station/station group with the 4 km radius
- Impact of HS1 on journey times and train frequencies
- Station usage
- Rail journeys TO London (journey origin at featured station/station group)
- Rail journeys FROM London (journey origin at London)
- Population
- Employment.

C.3 Note that due to their close proximity, in addition to the individual dashboards for Ebbsfleet and Gravesend stations, we have also created a dashboard for these two stations combined.

C.4 The dashboards are thus for each of the following geographic areas:

- Ashford
- Canterbury
- Ebbsfleet
- Gravesend
- Ebbsfleet and Gravesend combined
- Folkestone and Dover
- Maidstone
- Medway
- Rural Kent coast
- Sittingbourne and Faversham
- Thanet
- Whitstable and Herne Bay

Ashford International

All data indexed to 2009

2 trains per hour, 63 minutes to London -> 2 trains per hour, 36 minutes to London (43% decrease)

Ashford | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

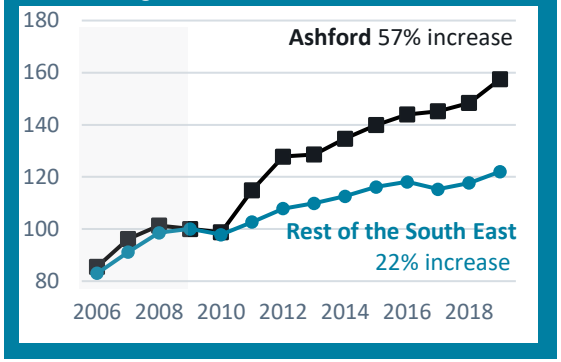
- Usage of Ashford station has increased above the average for the South East.
- The majority of rail travel from Ashford is journeys towards London, but there has been faster growth in travel in the opposite direction from London to Ashford.
- Population growth is above the trend for both Kent and the wider South East, and growth was even higher in the immediate area of the station.
- Employment growth is close to the regional average and does not reflect an increased population.

Usage of Ashford International station increased substantially above the rest of the South East following the introduction of HS1 services in 2009. Growth in travel towards London (which accounts for the majority of traffic) was higher than the rest of the South East. However growth in the other direction, towards Ashford, was considerably higher than the broader trend – this suggests Ashford has become a more attractive destination.

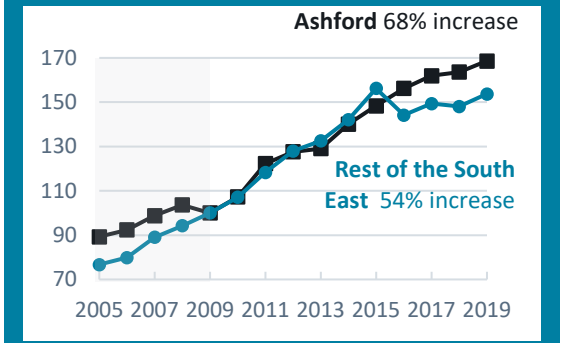
Population growth was above the wider trend for the South East and the rest of Kent., and the difference was larger in the immediate area within 800m of the station. This high population growth within walking distance of the station means that HS1 could be a factor in the decision to locate there.

Employment growth is closer to the regional average, with no clear trend. This suggests that additional population growth does not reflect increased numbers of people working locally.

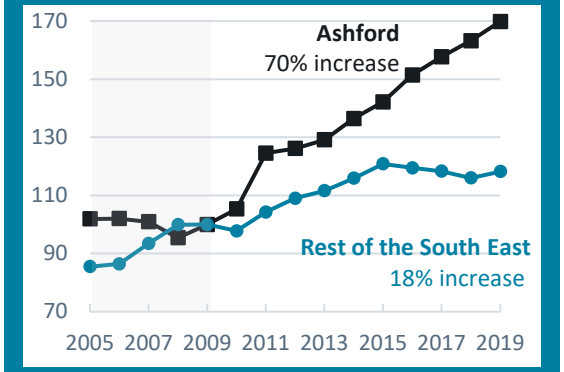
Station usage

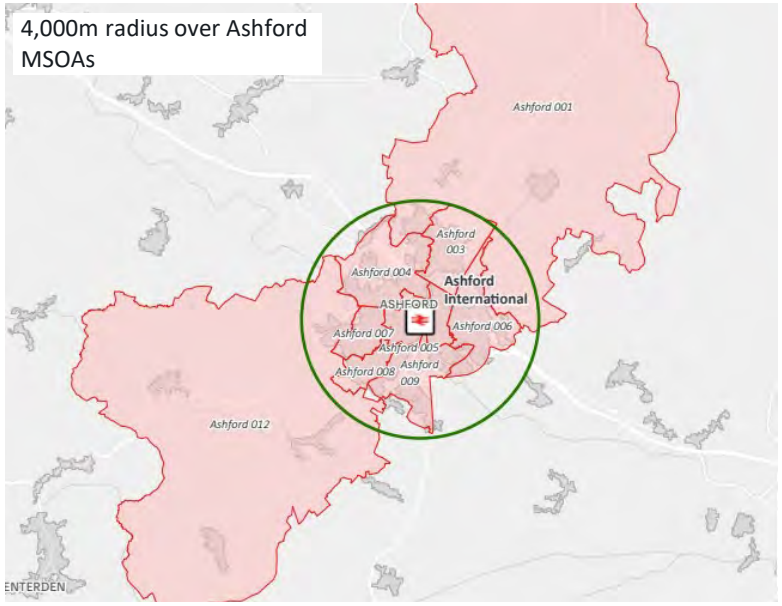


Rail journeys to London stations

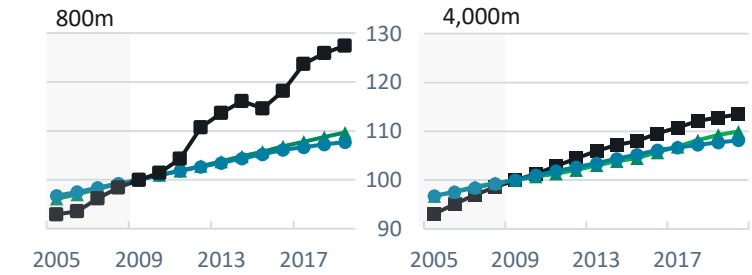


Rail journeys from London Stations

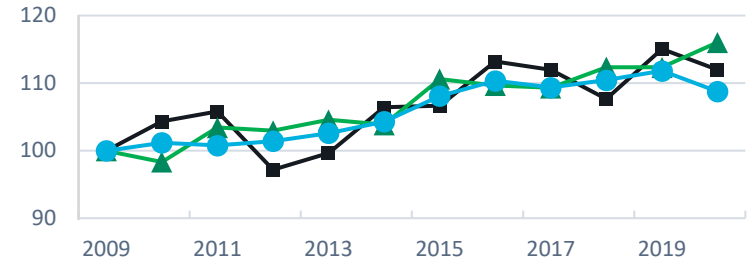




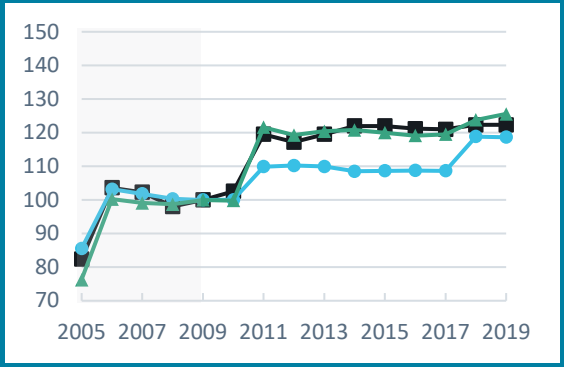
Population in station radiuses



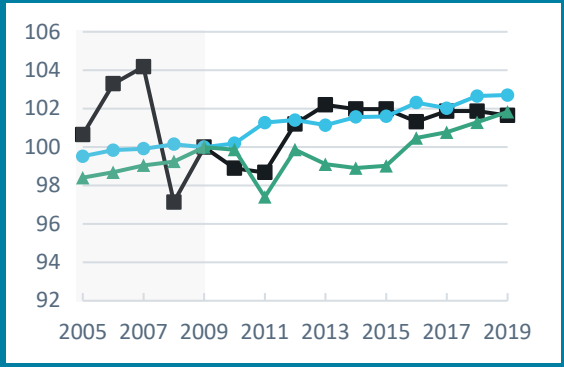
Employment in 4000m station radius



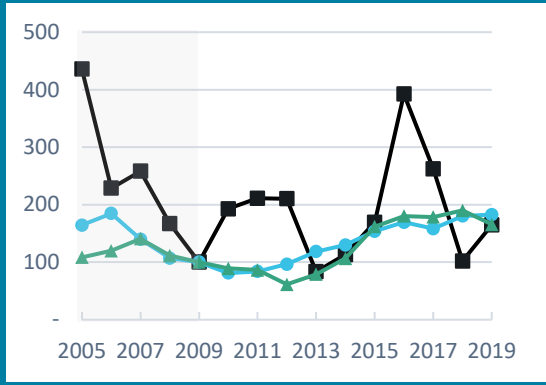
Commercial rateable value per sqm



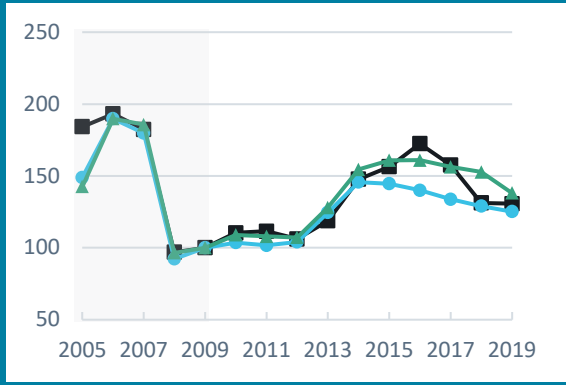
Commercial floorspace (sqm)



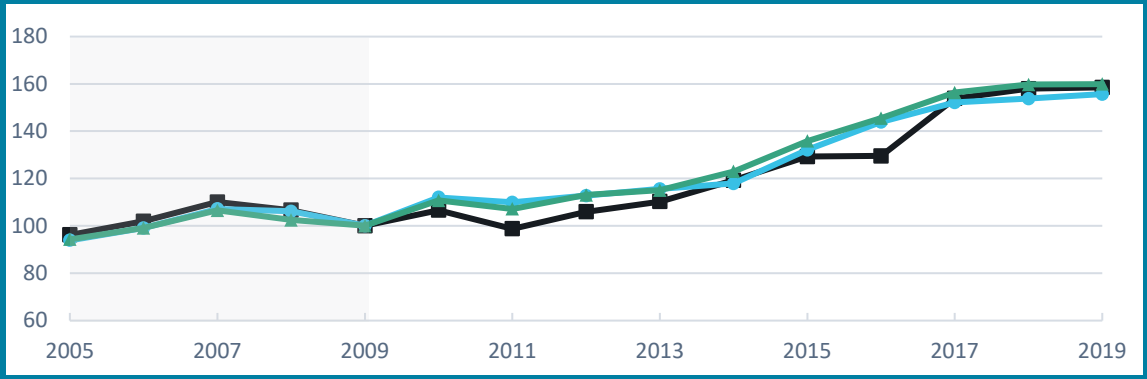
New build residential transaction volumes



Residential transaction volumes



Median residential sale prices



Ashford International

2 trains per hour, 63 minutes to London -> 2 trains per hour, 36 minutes to London (43% decrease)
All data indexed to 2009

Ashford

Rest of the South East

Rest of Kent (excluding HS1 areas)

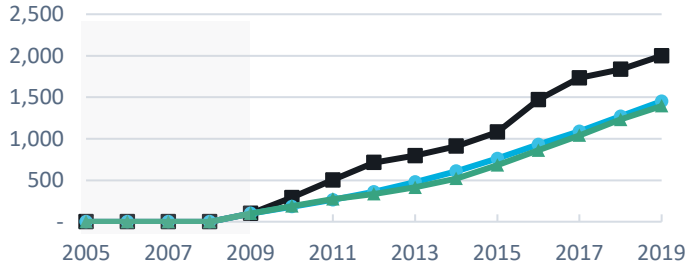
Rateable values for commercial property have been largely flat over this period, in line with the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 Valuation Officer Exercise revaluation exercise.

Commercial floorspace has grown only slightly (3%) over the period between 2009-2019. The trend in the South East as a whole was similar but there was faster growth in the rest of Kent.

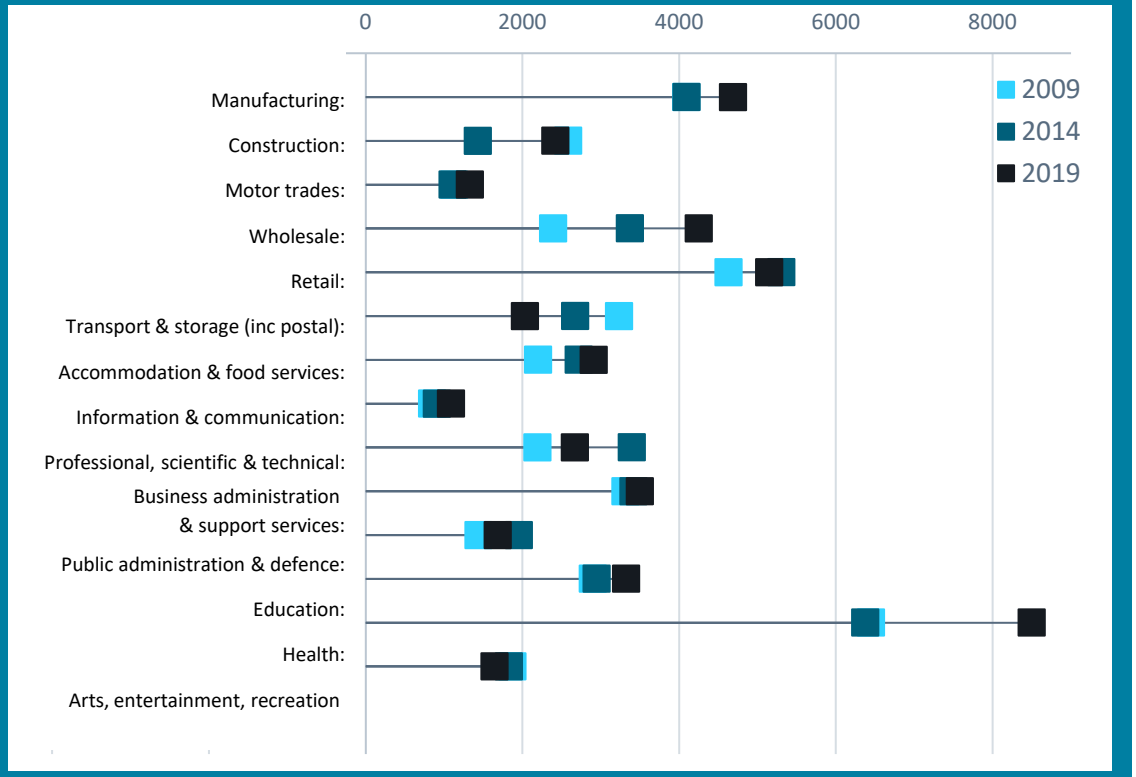
Changes to the volume of **residential property sales** in Ashford are driven by the supply of new build properties, which changes significantly between years. A total of 2,161 new properties were sold between 2009-2019, 13% of total sales: the average for the South East was 14%. However, new build sales have been growing faster in Ashford than in the rest of Kent and the South East since 2009.

The trend in **prices paid for residential property** is affected by the high proportion of new construction, with flat growth in 2016 where new build supply was particularly high. In the longer term growth is highly correlated but slightly below the general trend in Kent and the rest of the South East.

Cumulative new build residential transactions



Change in employment sectors in Ashford (2009 – 2019)



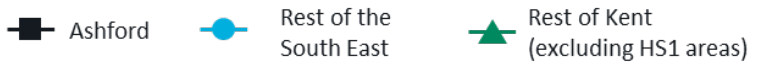
GVA growth per capita was flat in Ashford between 2015-2018, below the trend in Kent and the South East, before increasing in 2019.

Employment in this area increased by 15% between 2009 and 2019: there were substantial increases in employment in the Health (over 2000 additional jobs, 20% growth) and Wholesale (~1000 additional jobs. 25% growth) sectors, whereas employment in Transport (1300 fewer jobs, 33% decrease) decreased over this period.

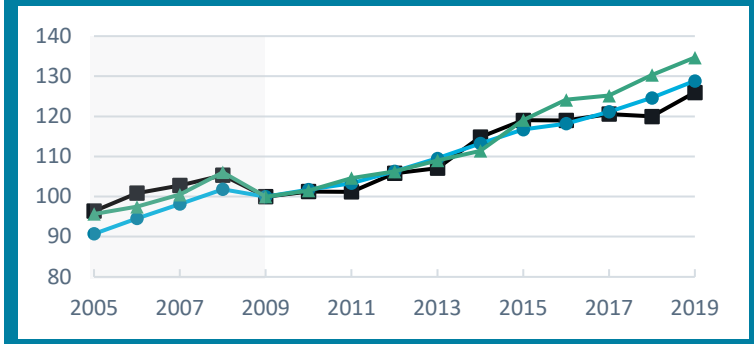
There is little **tourism** to Ashford, although it declined between 2016-2019.

Ashford International

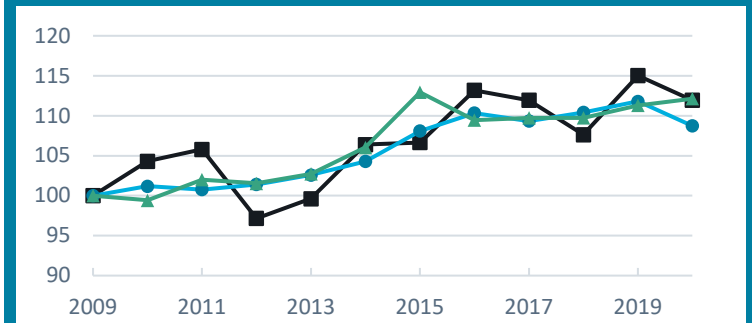
2tph, 63 minutes to London -> 2 tph, 36 minutes to London (43% decrease)



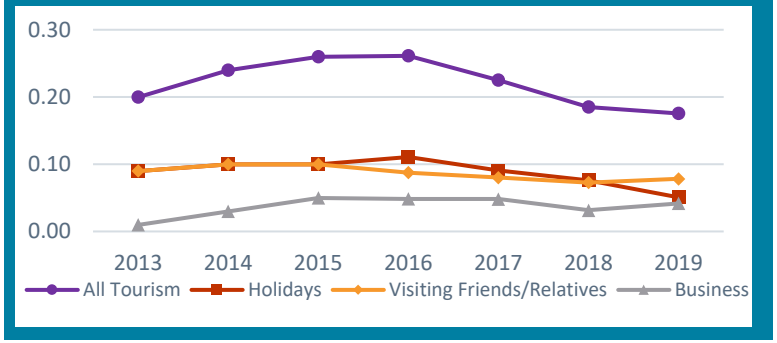
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Canterbury

All data indexed to 2009

1 trains per hour, 87 minutes to London -> 1 trains per hour, 54 minutes to London (38% decrease)

Canterbury | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

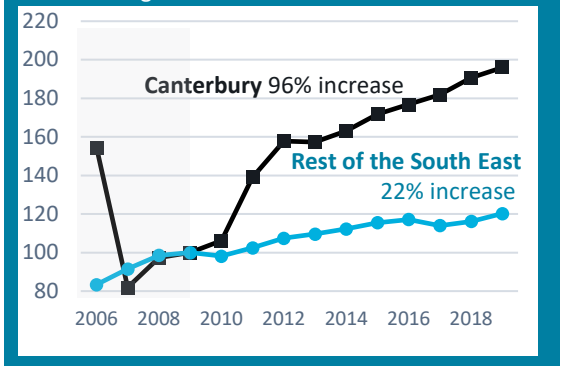
- Usage of Canterbury station has increased substantially above the average for the South East.
- Travel has grown both to and from London.
- Population growth is above the trend for both Kent and the wider South East, and growth was even higher in the immediate area of the station.
- Employment growth is below the regional average.

Usage of Canterbury West station increased substantially above the rest of the South East following the introduction of HS1 services in 2009. There has been substantial growth in travel both towards London and from London to Canterbury – this suggests Canterbury has become a more attractive destination, as well as an increase in business or commuter travel by residents.

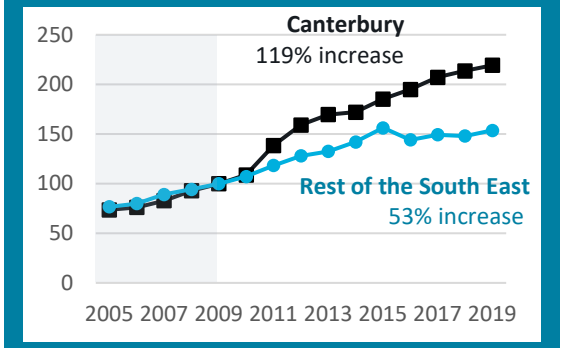
Population growth was substantially above the wider trend for the South East and the rest of Kent. There was the same level of growth within the smaller 800m radius and the wider area, so there is no observed trend towards densification.

Employment growth is below the regional average, particularly after 2017. This needs to be considered in the context of increasing student numbers in the town, who likely account for a large proportion of population growth but are less likely to be working.

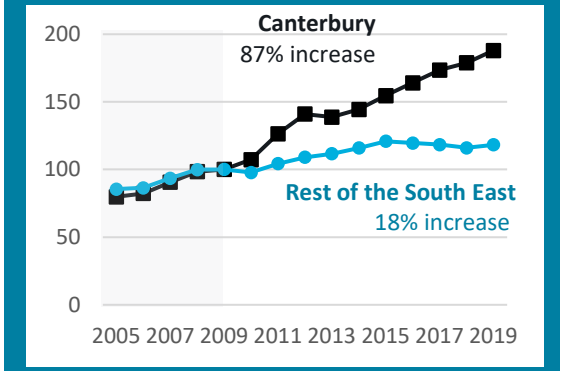
Station usage

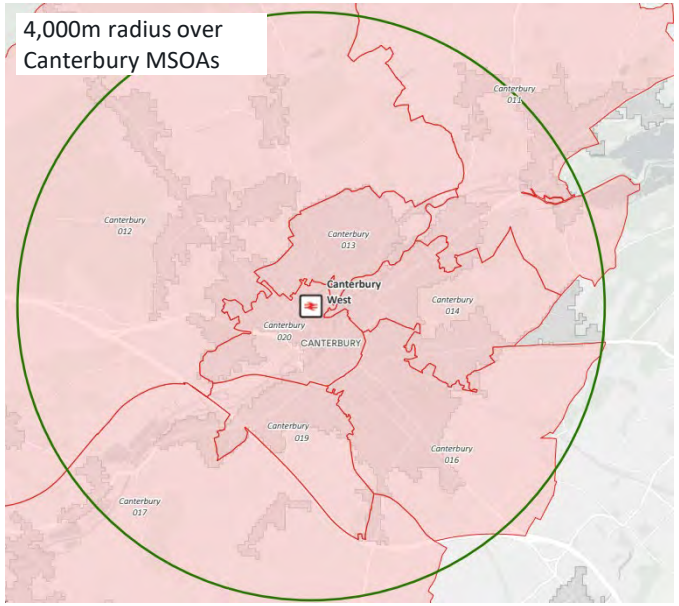


Rail journeys to London stations

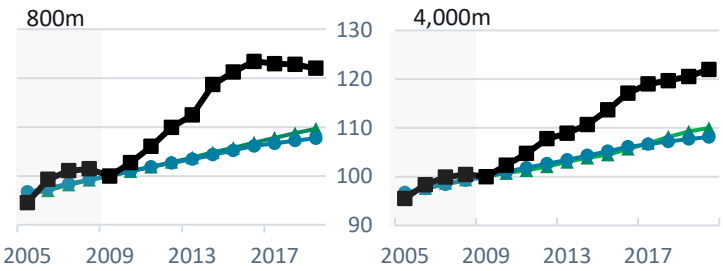


Rail journeys from London stations

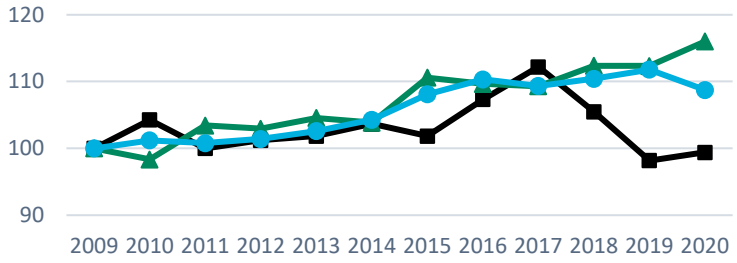




Population in station radiuses

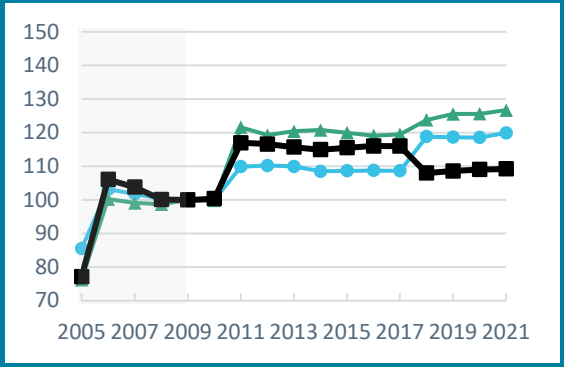


Employment in 4000m station radius

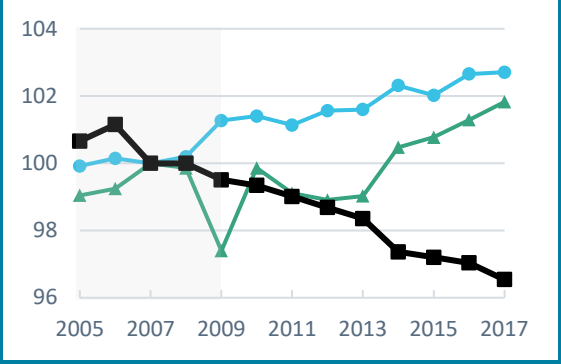


steer

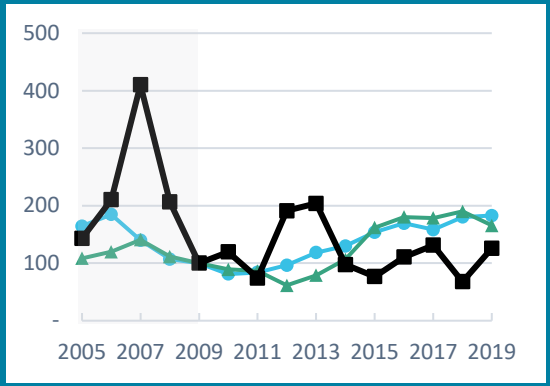
Commercial rateable value per sqm



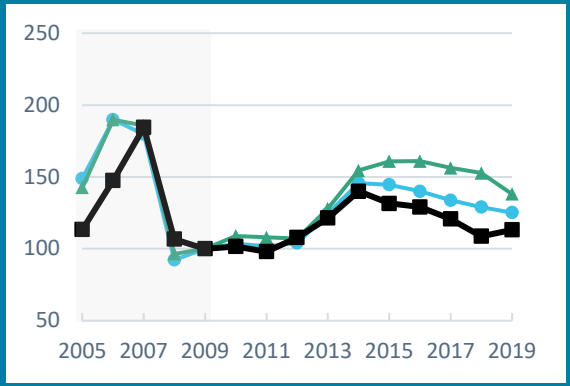
Commercial floorspace (sqm)



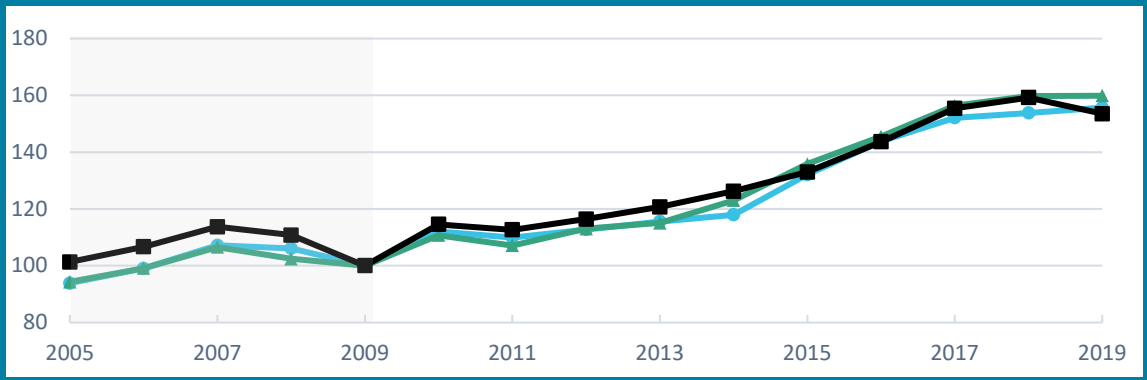
New build residential transaction volumes



Residential transaction volumes



Median residential sale prices



Canterbury

1 trains per hour, 87 minutes to London -> 1 trains per hour, 54 minutes to London (38% decrease)
All data indexed to 2009

Canterbury | Rest of the South East | Rest of Kent (excluding HS1 areas)

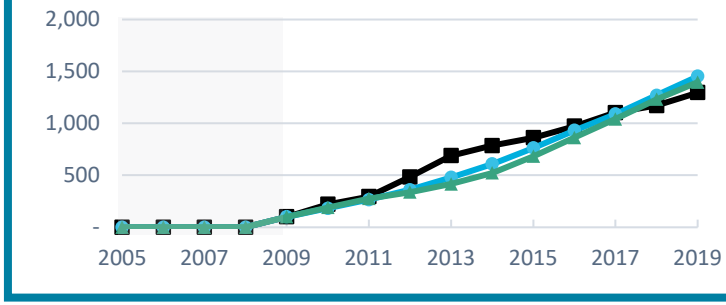
Rateable values for commercial property have been largely flat over this period, in line with the broader trend, but dropped in 2018. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has dropped over the period between 2009-2019. This could reflect growth in student numbers, if student accommodation is replacing commercial space.

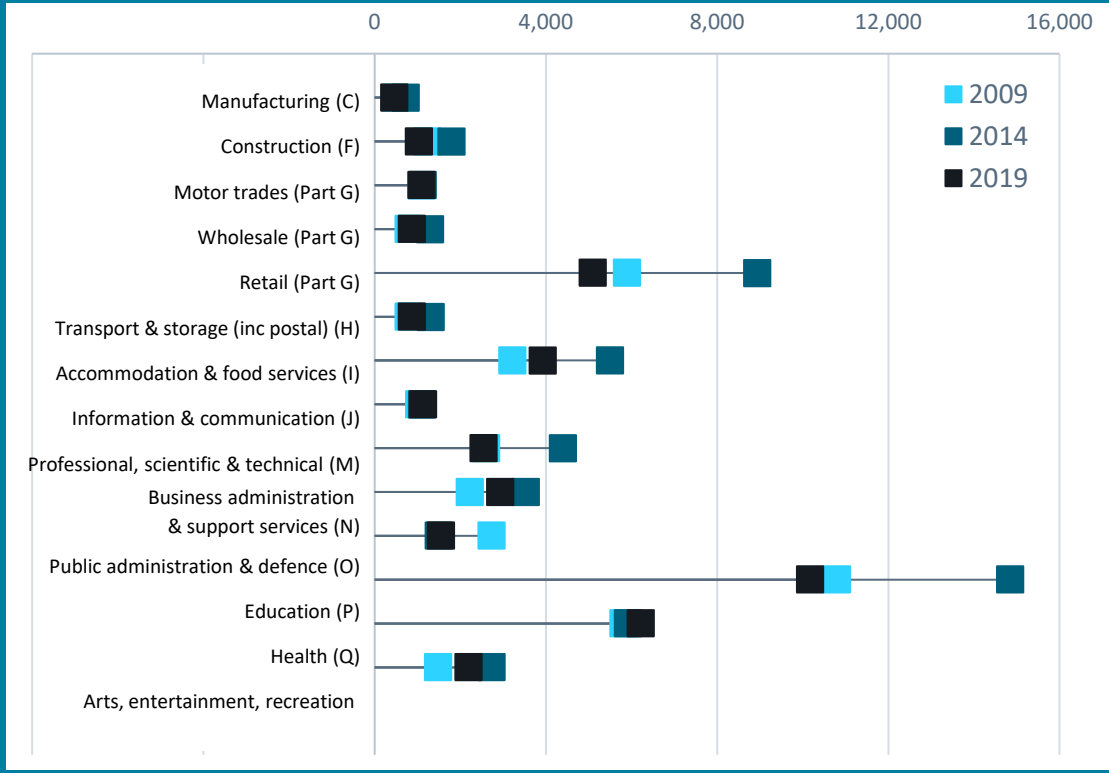
This is also likely to reflect **residential property data** – Canterbury has an extremely high ratio of students to permanent residents. Volumes of sales and of new build property are both below the average for Kent over the period as a whole, although there were larger volumes of new build properties between 2011-2015.

The trend in **prices paid for residential property** is highly correlated with the general trend in Kent and the rest of the South East.

Cumulative new build residential transactions



Change in employment sectors in Canterbury (2009 – 2019)



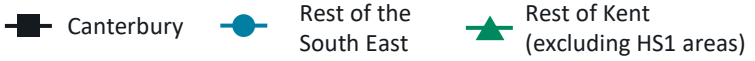
GVA growth per capita is below the trend in Kent and the South East. This is likely to reflect the unusual nature of the population in Canterbury, with very high (and increasing) numbers of students.

Employment in this area is quite volatile, with the number of employees increasing from 2015-2017 and then dropping. The largest sectors are retail and higher education, both of which employed more people in 2014 than 2019. The only sector that did grow consistently over this period is health, which is reflective of broader national trends.

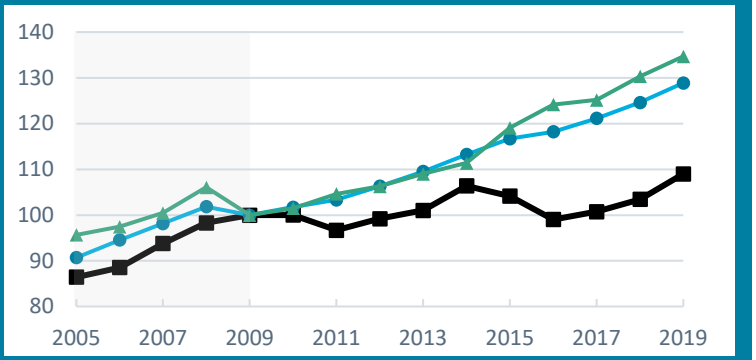
Tourism to Canterbury is broadly stable over the period where data exists, although this postdates the introduction of HS1.

Canterbury

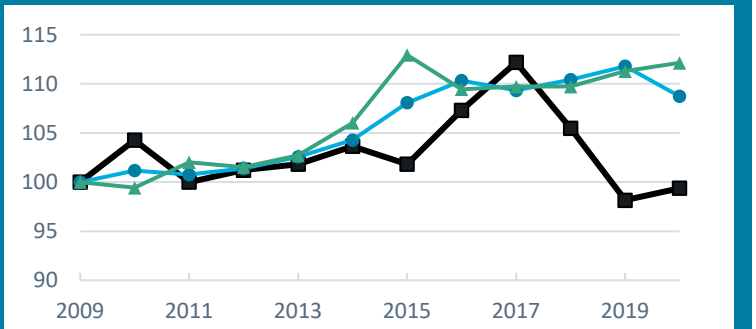
1 tph, 87 minutes to London -> 1 tph, 54 minutes to London (38% decrease)



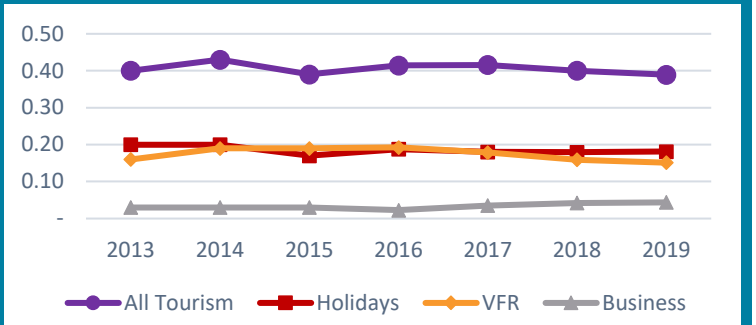
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Ebbsfleet

All data is indexed to 2009 unless otherwise mentioned

New station – 4 tph to London, 19 minutes

Ebbsfleet | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

- Ebbsfleet station did not have regular domestic passenger services until 2010.
- There has been faster growth in travel to London, reflecting the use of the station for business and commuting travel.
- Population growth is above the trend for both Kent and the wider South East.
- Employment growth is above the trend for both Kent and the wider South East.

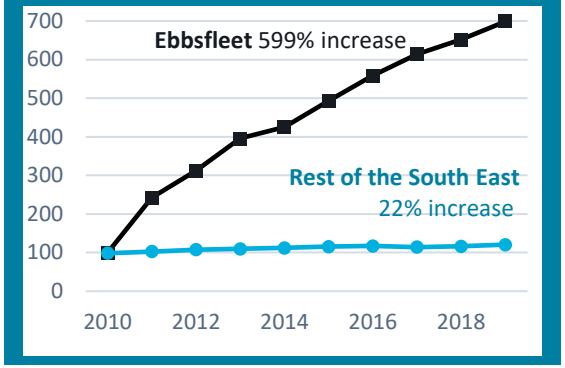
Data for Ebbsfleet should be interpreted carefully: prior to the station opening it wasn't a clear residential centre, with the population centred in Dartford and Gravesend.

Usage of Ebbsfleet International station started in 2010 with the introduction of HS1 services. Growth in travel towards London was faster than growth in traffic from London to Ashford. This is likely due to the use of Ebbsfleet as a park and ride destination – it has a large car park and is very close to the M25.

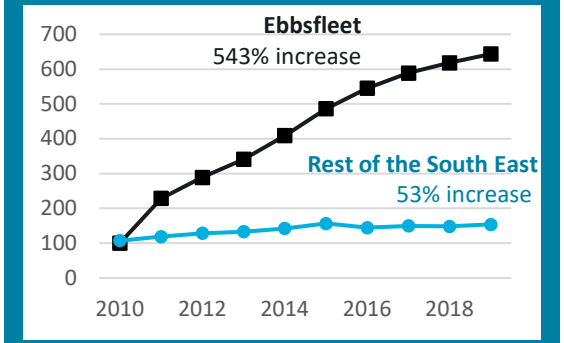
Population growth was above the wider trend for the South East and the rest of Kent. Ebbsfleet garden city has been developed towards the end of the time period and did not exist at the time of the 2011 census, therefore there is no relevant data for the 800m radius.

Employment growth is above the regional average.

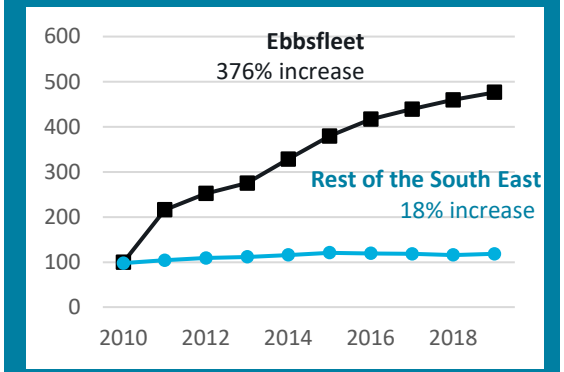
Station usage (indexed to 2010)

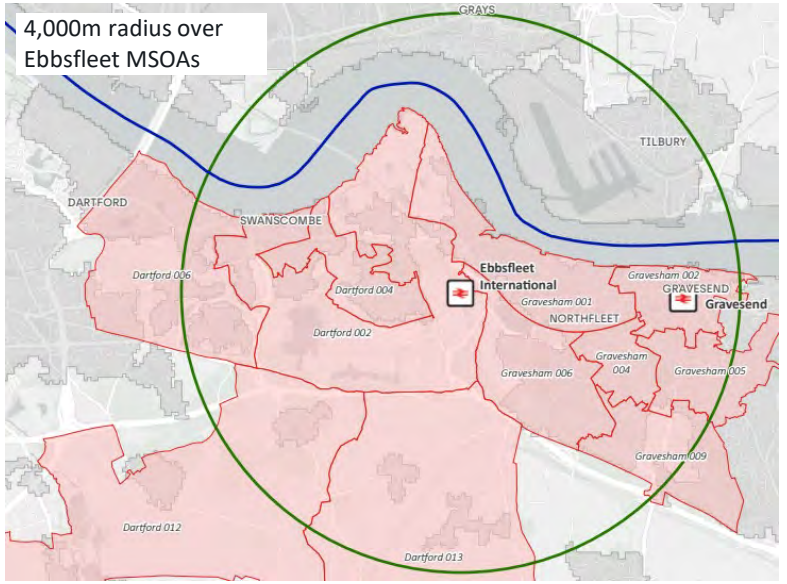


Rail journeys to London stations (indexed to 2010)

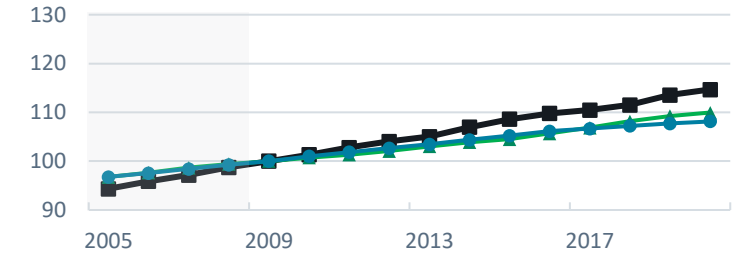


Rail journeys from London Stations (indexed to 2010)

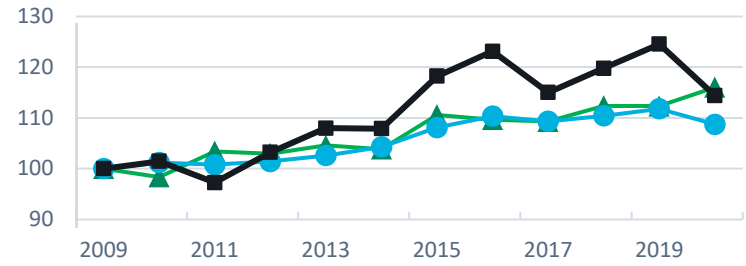




Population in 4,000m station radius (No relevant data for 800m)



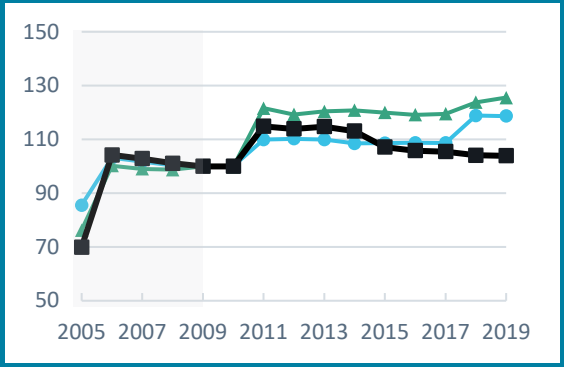
Employment in 4000m station radius



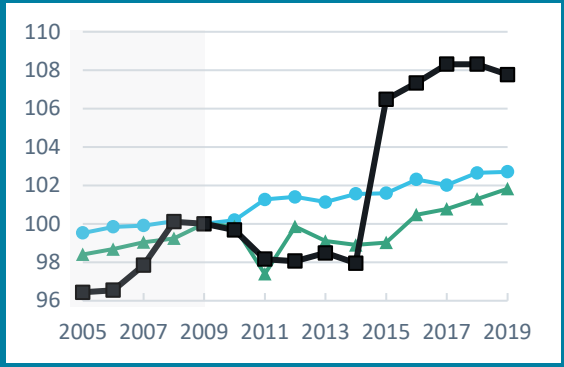
Ebbsfleet

New station – 4 tph to London, 19 minutes
All data indexed to 2009

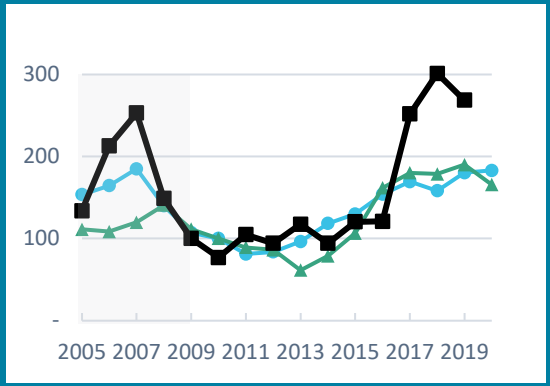
Commercial rateable value per sqm



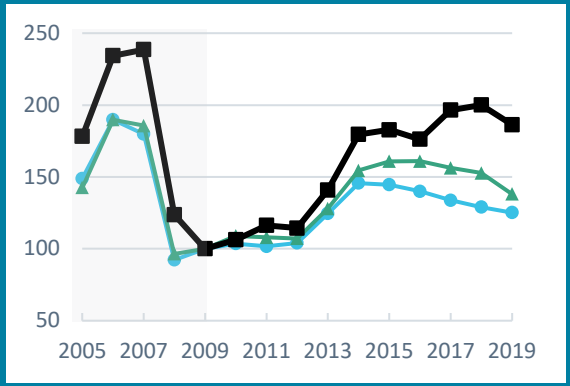
Commercial floorspace (sqm)



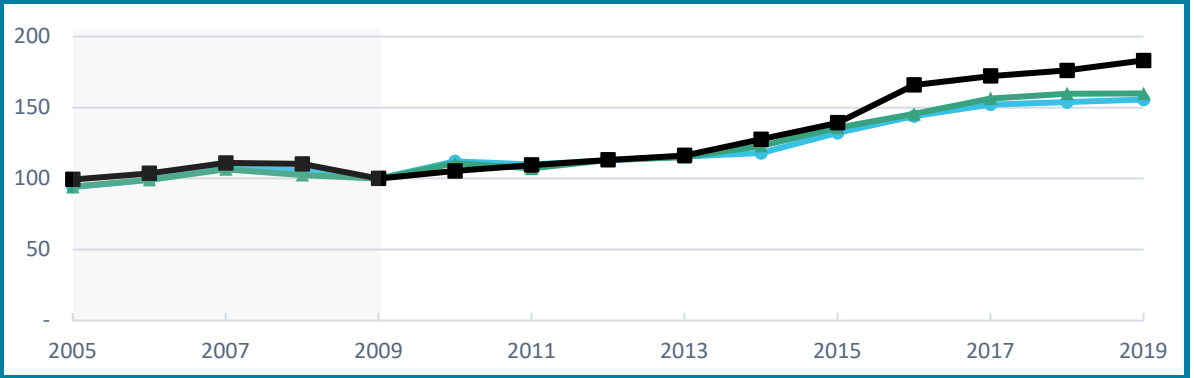
New build residential transaction volumes

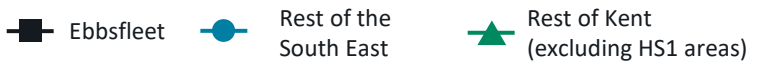


Residential transaction volumes



Median residential sale prices



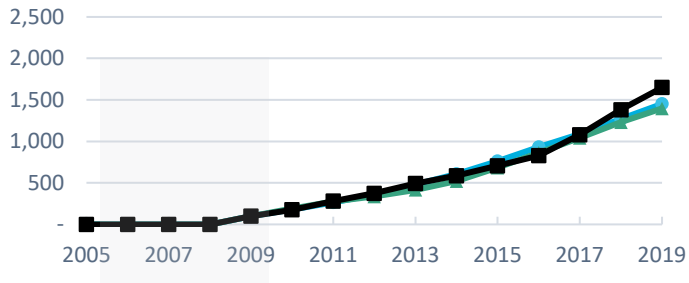


Rateable values for commercial property dropped over this period, at the same time as a large increase in **commercial floorspace.** This is unlike the pattern seen in the rest of Kent and the South East.

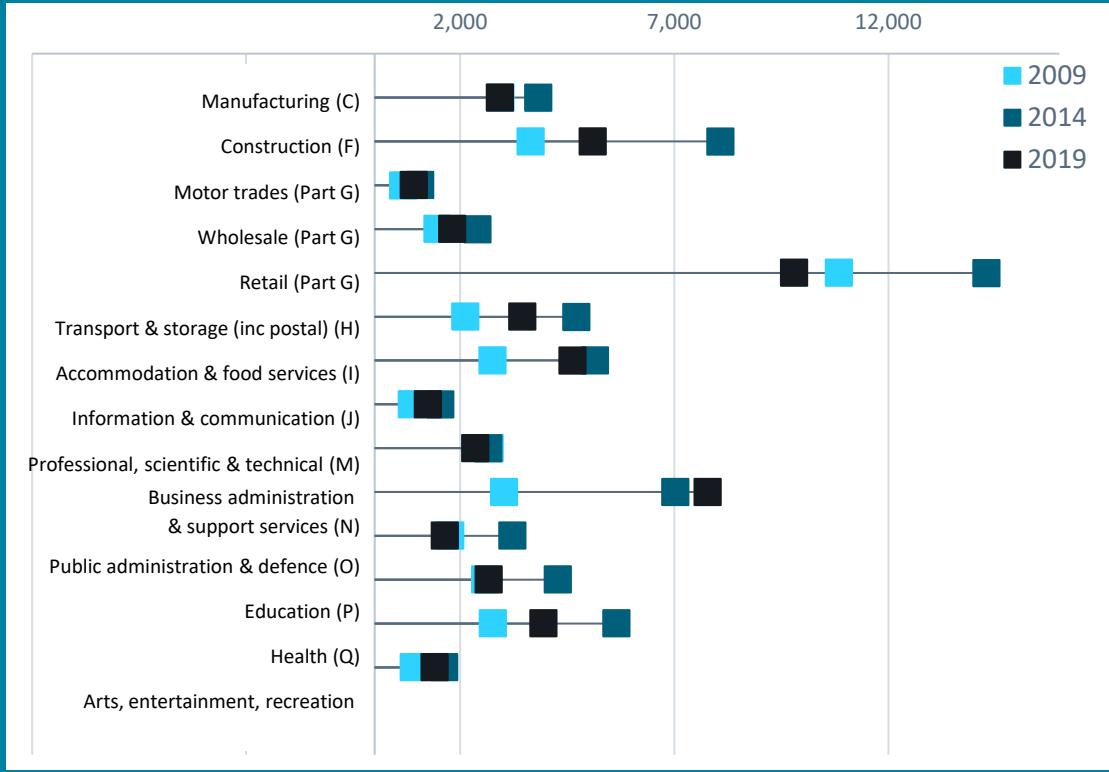
Residential transaction volumes and prices started to grow above the general trend for Kent and the South East in 2015 when the Ebbsfleet Valley garden city development was initially announced. The first new build properties at Ebbsfleet (as opposed to other developments in the local area) were sold in 2017, which coincides with a big spike in the volume of new builds sold.

The majority of large scale development is centred on Ebbsfleet International station – however there are also other development areas within the 4000m radius. The majority of the commercial development at Ebbsfleet is, for example, still to take place, so the increase in commercial floorspace will also reflect other areas.

Cumulative new build residential transactions



Change in employment sectors in Ebbsfleet (2009 – 2019)



GVA growth per capita is broadly in line with the regional trend, with periods of faster growth. Some of this may be as a result of construction activity.

Employment in this area increased by 14% between 2009 and 2019, but there have been a series of peaks and declines. Retail is the largest employment sector, focused on Bluewater.

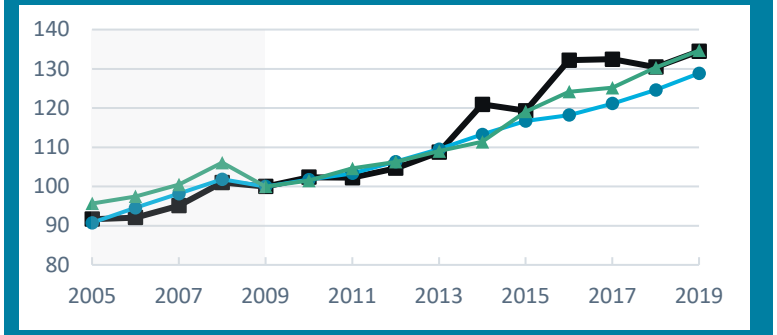
Tourism has been steadily declining since 2014, driven by a reduction in Visiting Friends and Relatives as Holidays and Business visits have remained consistently low.

Ebbsfleet

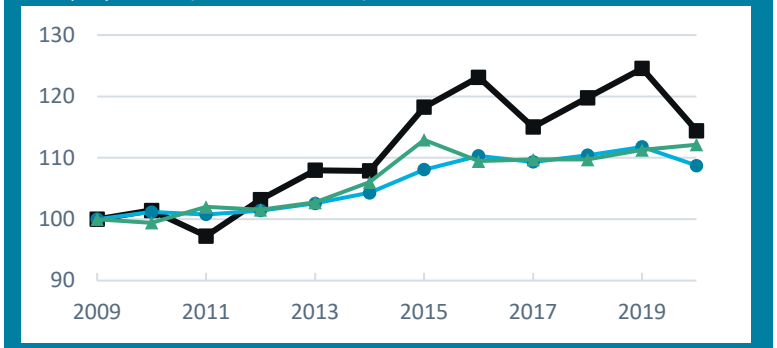
New station – 4 tph to London, 19 minutes

Ebbsfleet | Rest of the South East | Rest of Kent (excluding HS1 areas)

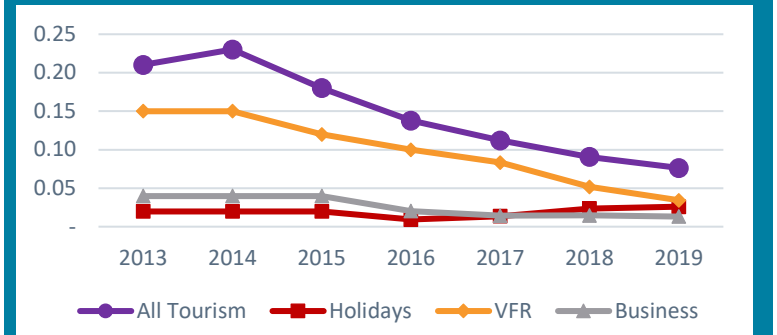
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Gravesend

All data indexed to 2009

2 trains per hour, 51 minutes to London -> 2 trains per hour, 23 minutes to London (55% decrease)

Gravesend | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

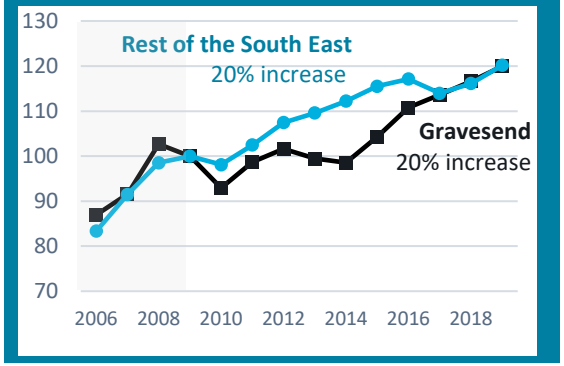
- Usage of Gravesend station is increasing at the same rate as the rest of the South East.
- Journeys towards London barely increased at all in the period – there was no trend towards commuting.
- Population growth is above the trend for both Kent and the wider South East, and growth was higher in the immediate area of the station.
- Employment growth is as a whole close to the regional average.

Usage of Ashford International station increased at the same pace as the rest of the South East, without substantial growth following the introduction of HS1 services in 2009. Growth in travel towards London was much lower than the rest of the South East, and was largely flat. HS1 did not lead to higher volumes of business or commuter travel. Travel from London to Gravesend was above the regional trend, but this makes up a small proportion of total journeys.

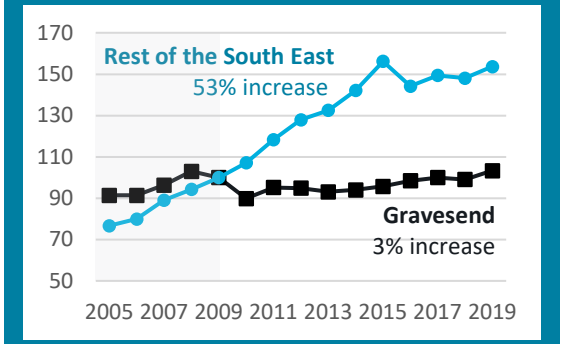
Population growth was above the wider trend for the South East and the rest of Kent, and the difference was larger in the immediate area within 800m of the station. This high population growth within walking distance of the station means that rail services could be a factor in the decision to locate there, but this does not seem to be borne out by rail usage.

Employment growth is closer to the regional average, with no clear trend.

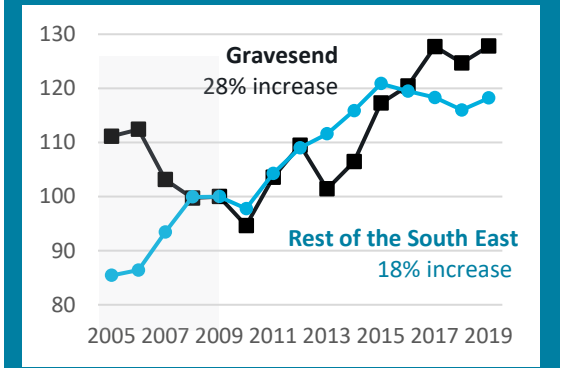
Station usage

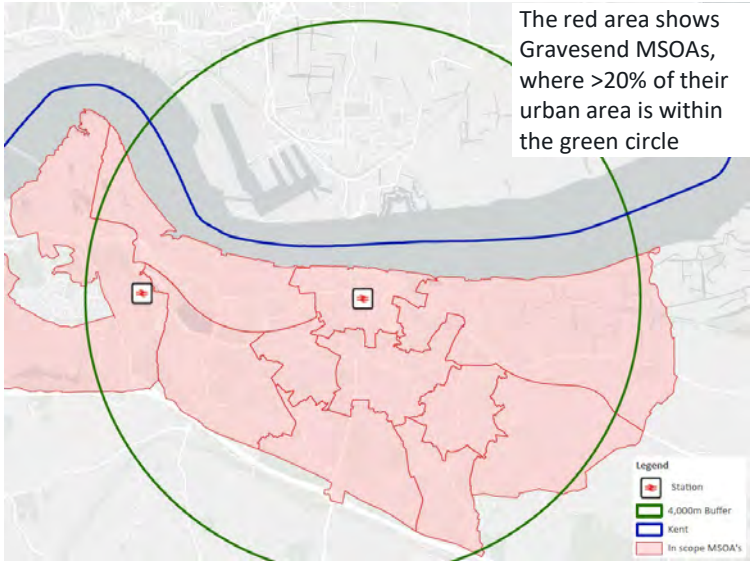


Rail journeys to London stations

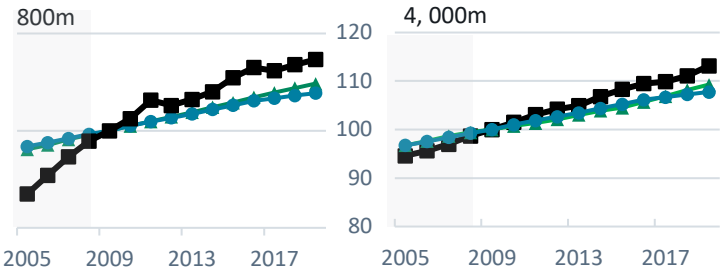


Rail journeys from London Stations

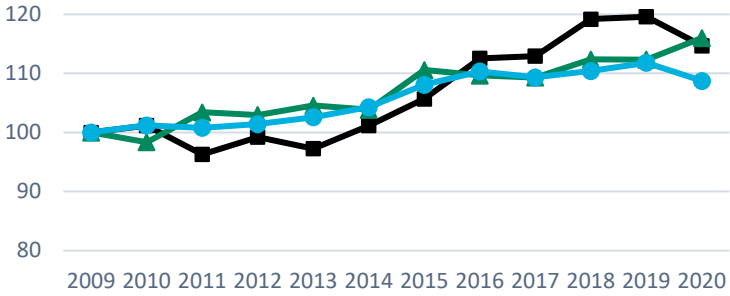




Population in station radiuses



Employment in 4000m station radius



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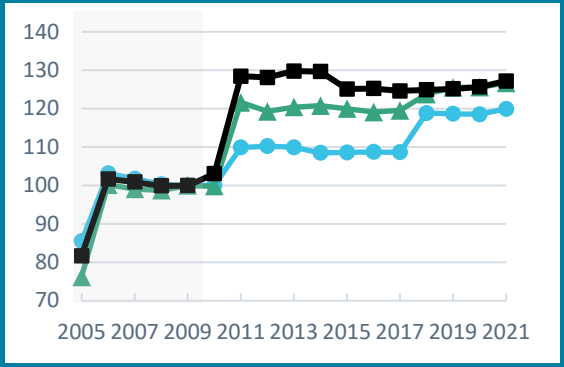
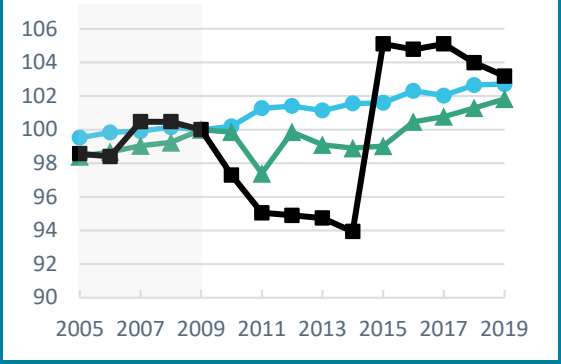
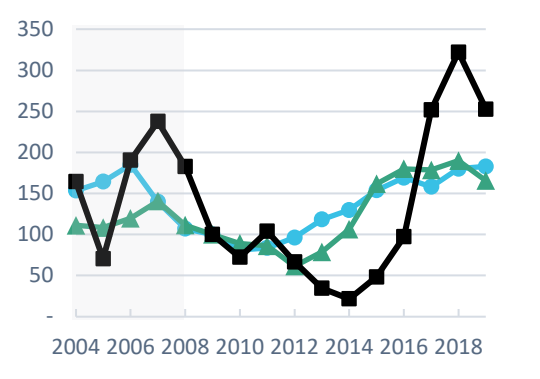
Commercial rateable value per sqm



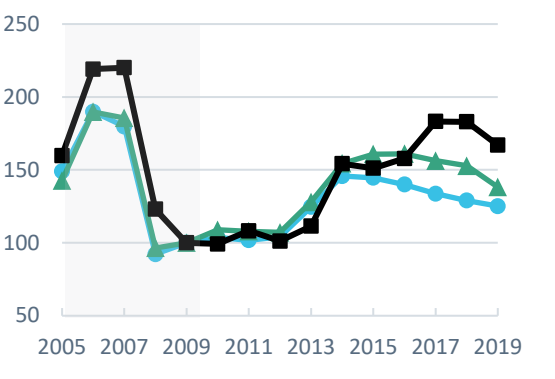
Commercial floorspace (sqm)



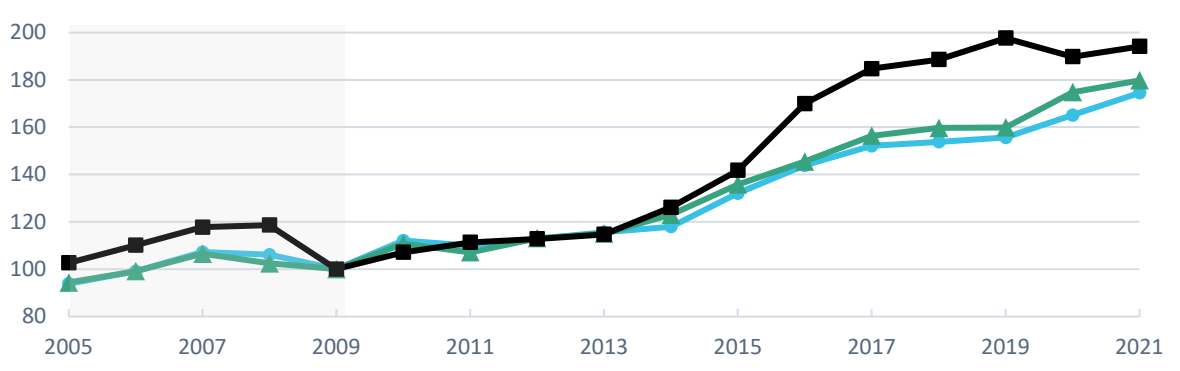
New build residential transaction volumes



Residential transaction volumes



Median residential sale prices



Gravesend

2 trains per hour, 51 minutes to London -> 2 trains per hour, 23 minutes to London (55% decrease)
All data indexed to 2009

Gravesend | Rest of the South East | Rest of Kent (excluding HS1 areas)

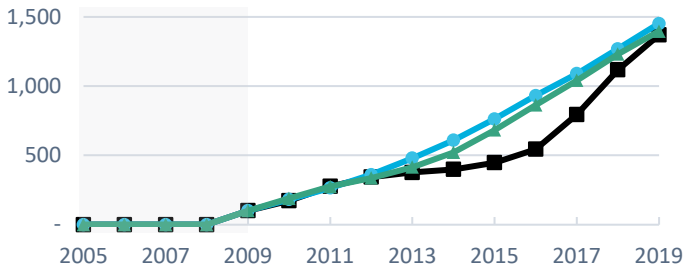
Rateable values for commercial property have been largely flat over this period, in line with the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has over the period as a whole grown by the same amount as in the rest of Kent and the South East. However, this masks a large drop from 2011-2014 followed by a substantial increase in 2015.

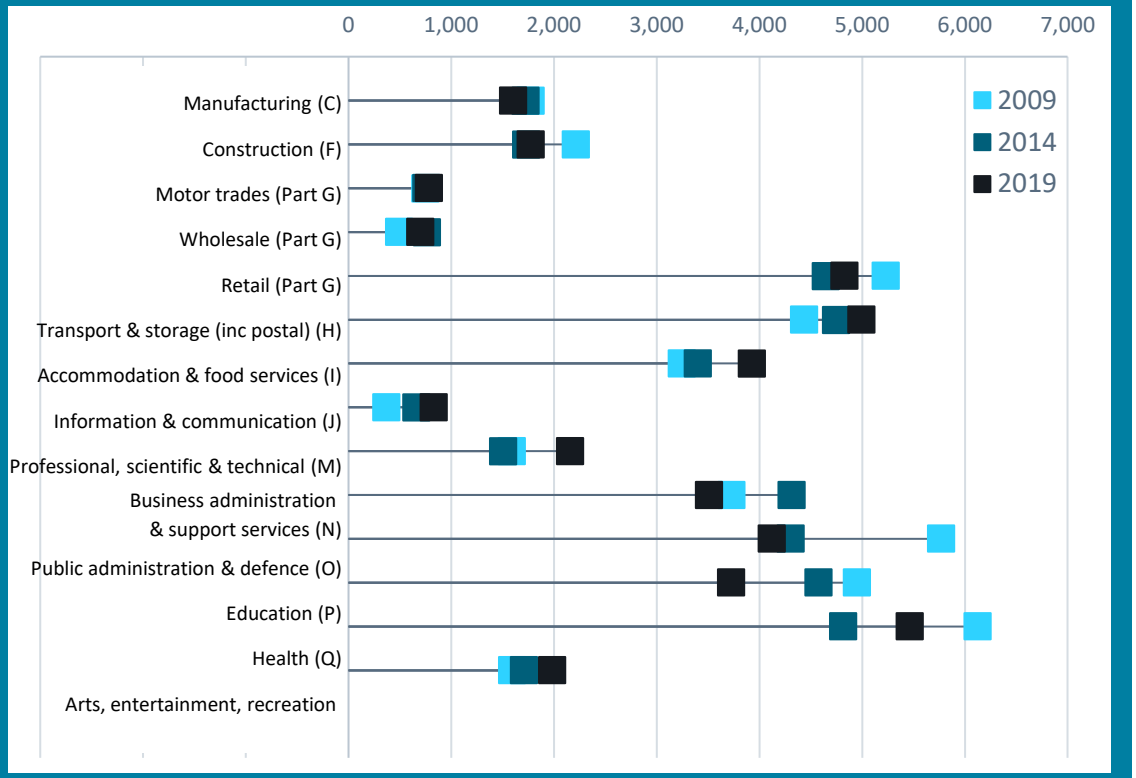
Residential property transaction volumes in Gravesend generally follow the trend in the rest of Kent and the South East. However there has been faster growth since 2017. This coincides with a large increase in the supply of new build property – the Gravesend catchment area overlaps with development around Ebbsfleet.

Growth in **prices paid for residential property** increased above the trend for the South East as a whole from 2016 onwards. These measures combined suggest housing in the region has become relatively more attractive over the last six years.

Cumulative new build residential transactions



Change in employment sectors in Gravesend (2009 – 2019)



GVA growth per capita was slightly above the general trend in Kent and the South East from 2016-2019, but in general very closely aligned.

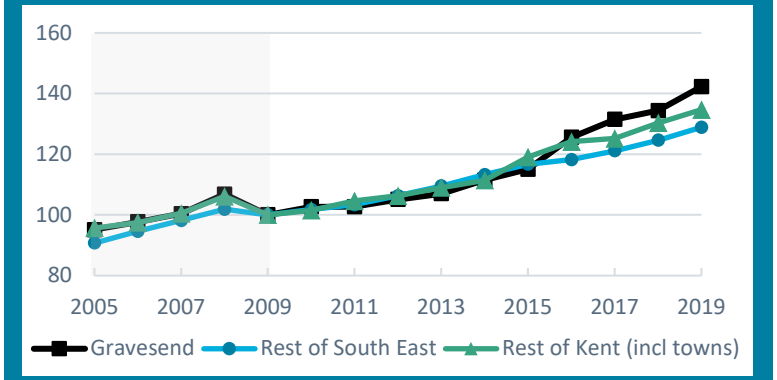
Employment in this area increased by 15% between 2009 and 2019: there were increases in employment in the Accommodation and Food Service sector (over 700 additional jobs,) and Professional, Scientific and Technical (around 600 additional jobs) sectors, whereas employment in Public Administration (2500 fewer jobs) decreased over this period.

Tourism to Gravesend decreased from 2014 onwards.

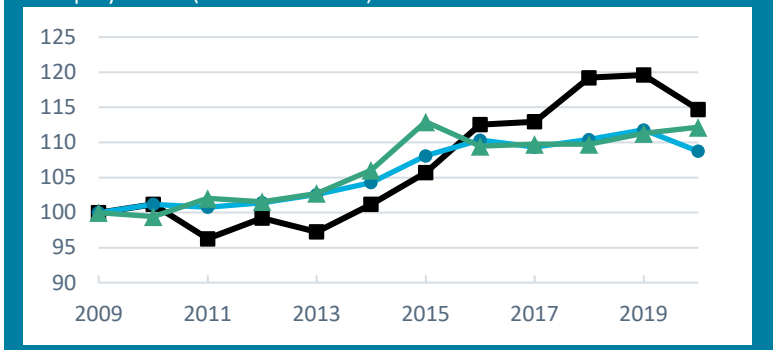
Gravesend

2 trains per hour, 51 minutes to London -> 2 trains per hour, 23 minutes to London (55% decrease)

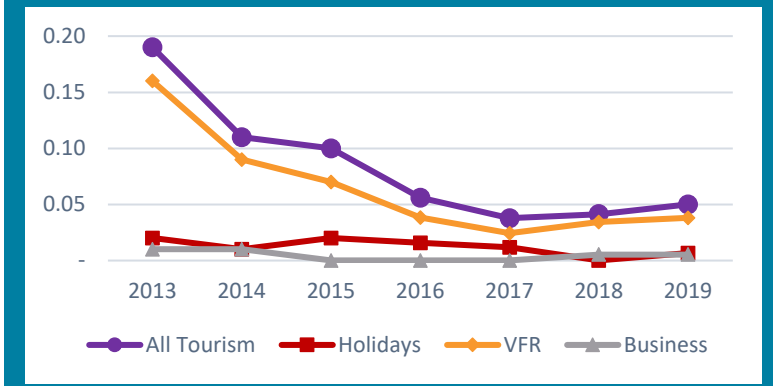
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Ebbsfleet + Gravesend

All data is indexed to 2009 unless otherwise mentioned

2 trains per hour, 51 minutes to London -> 6 trains per hour, 19 minutes to London

Ebbsfleet | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

- Ebbsfleet station opened in 2010 and has seen substantial growth in usage. It is likely to have abstracted some rail demand from nearby Gravesend, so the two are covered as a pair.
- There has been faster growth in travel from London than outward commuting
- Population growth is above the trend for both Kent and the wider South East.
- Employment growth is generally above the trend for both Kent and the wider South East.

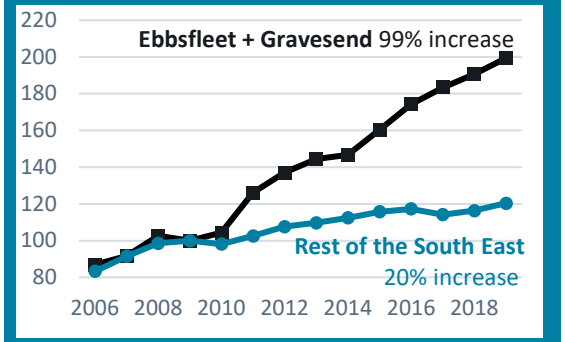
Ebbsfleet station opened in 2010 and is likely to have abstracted some rail usage from nearby Gravesend: the two are therefore covered as a pair.

Usage of Ebbsfleet and Gravesend stations increased from 2010, when Ebbsfleet opened. There was a larger increase in travel from London to the area than in travel to London. Travel from Ebbsfleet to London grew more quickly, but some of this travel was likely diverted from Gravesend station where growth was flat.

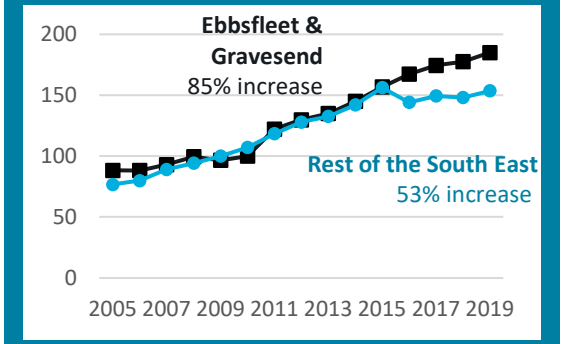
Population growth was above the wider trend for the South East and the rest of Kent. Ebbsfleet garden city has been developed towards the end of the time period and did not exist at the time of the 2011 census, therefore there is no relevant data for the 800m radius.

Employment growth is above the regional average.

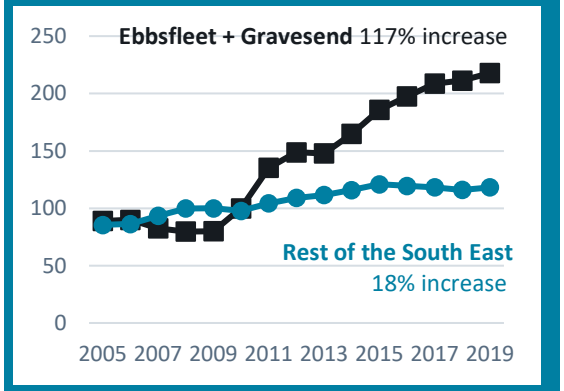
Station usage (indexed to 2010)

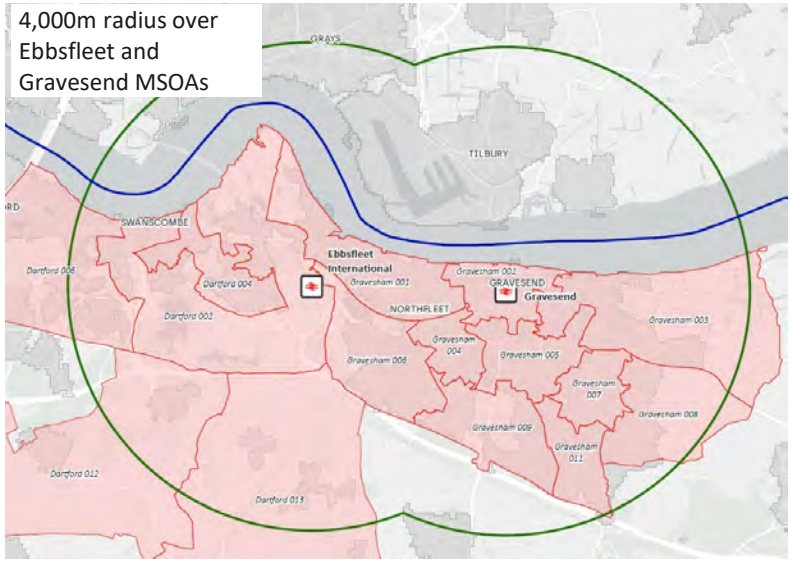


Rail journeys to London stations (indexed to 2010)

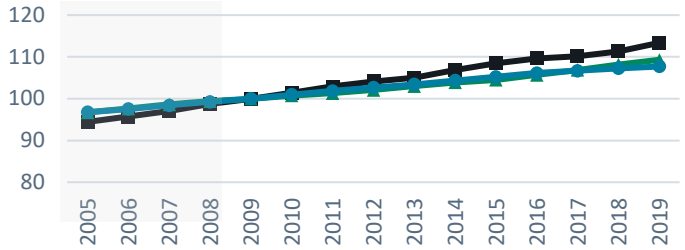


Rail journeys from London Stations

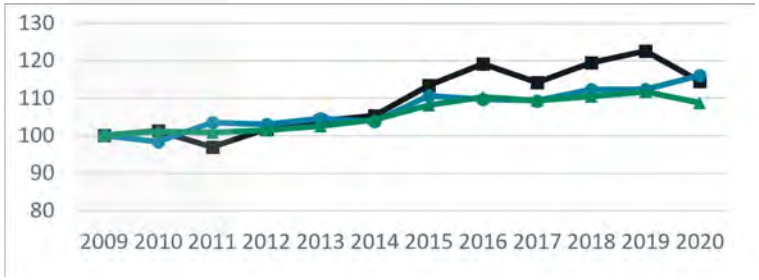




Population in 4,000m station radius (No relevant data for 800m)



Employment in 4000m station radius

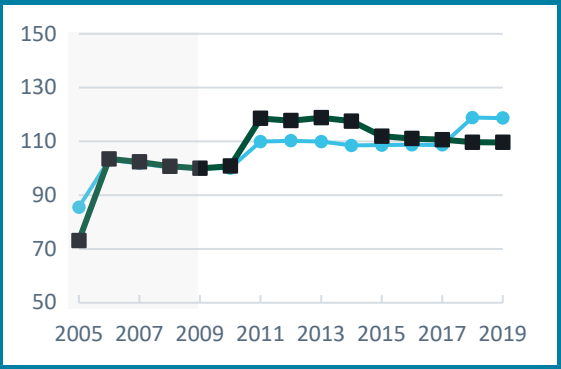


Ebbsfleet + Gravesend

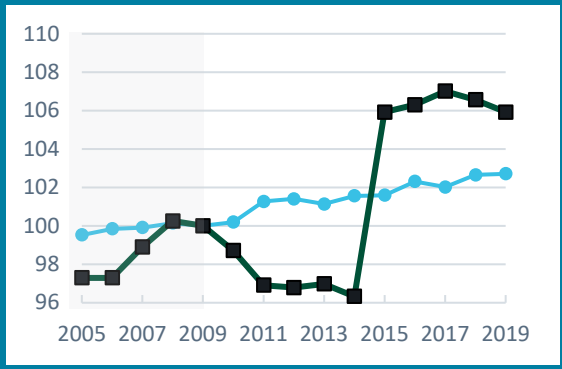
2 trains per hour, 51 minutes to London -> 4 trains per hour, 19 minutes to London
All data indexed to 2009

Ebbsfleet | Rest of the South East | Rest of Kent (excluding HS1 areas)

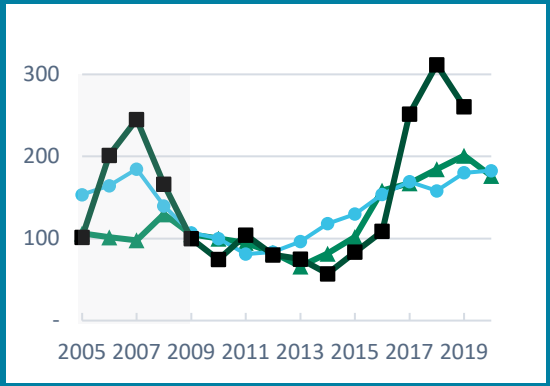
Commercial rateable value per sqm



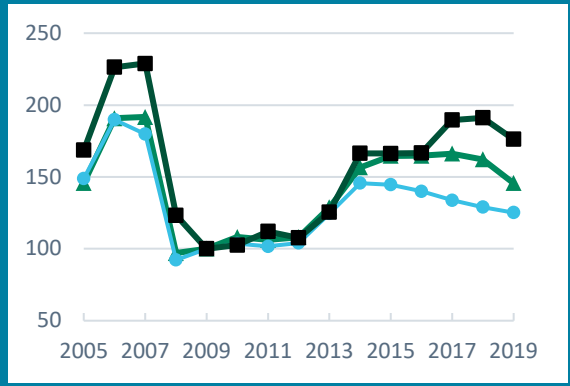
Commercial floorspace (sqm)



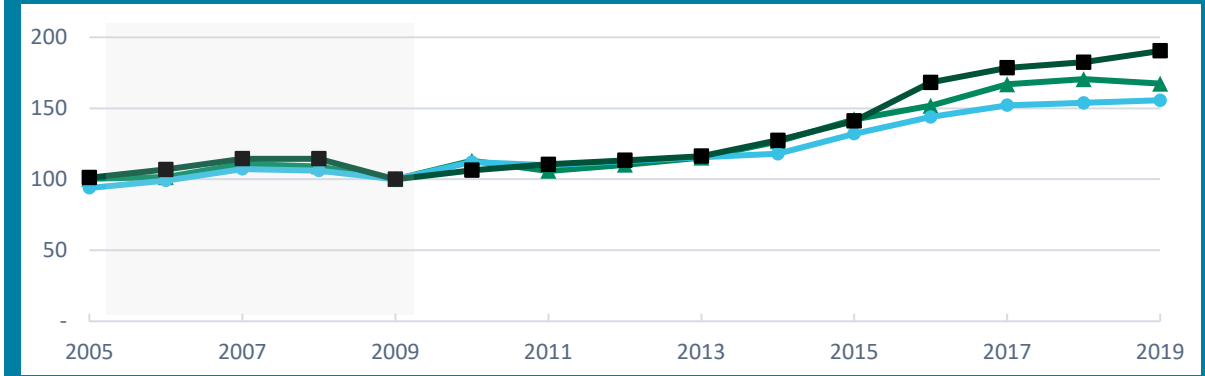
New build residential transaction volumes



Residential transaction volumes



Median residential sale prices

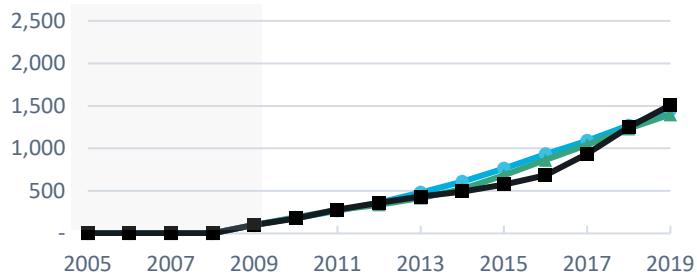


Rateable values for commercial property dropped over this period, at the same time as a large increase in **commercial floorspace.** This is unlike the pattern seen in the rest of Kent and the South East.

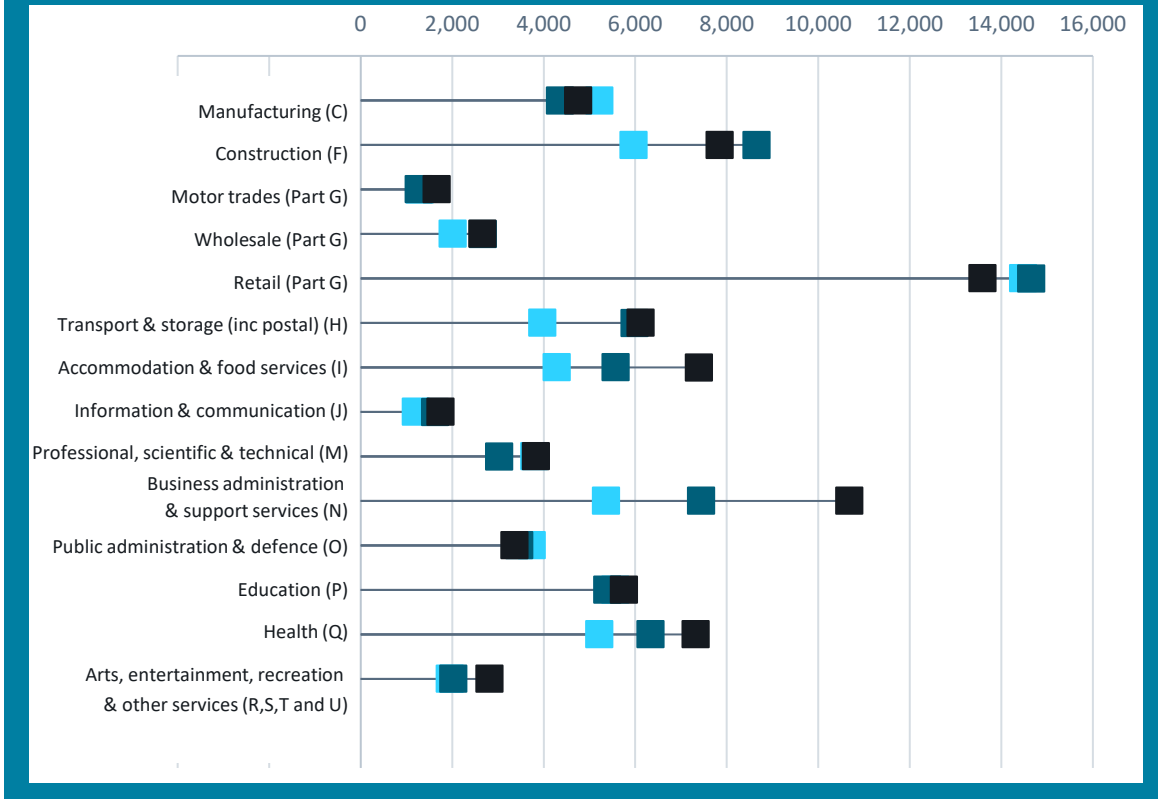
Residential transaction volumes and prices started to grow above the general trend for Kent and the South East in 2015 when the Ebbsfleet Valley garden city development was initially announced. The first new build properties at Ebbsfleet (as opposed to other developments in the local area) were sold in 2017, which coincides with a big spike in the volume of new builds sold.

The majority of large scale development is centred on Ebbsfleet International station – however there are also other development areas within the 4000m radius. The majority of the commercial development at Ebbsfleet is, for example, still to take place, so the increase in commercial floorspace will also reflect other areas.

Cumulative new build residential transactions



Change in employment sectors in Ebbsfleet & Gravsend (2009 – 2019)



GVA growth per capita is above the regional trend, with periods of faster growth. Some of this may be as a result of construction activity.

Employment in this area increased by 16% between 2009 and 2019, but there have been a series of peaks and declines. Retail is the largest employment sector, focused on Bluewater.

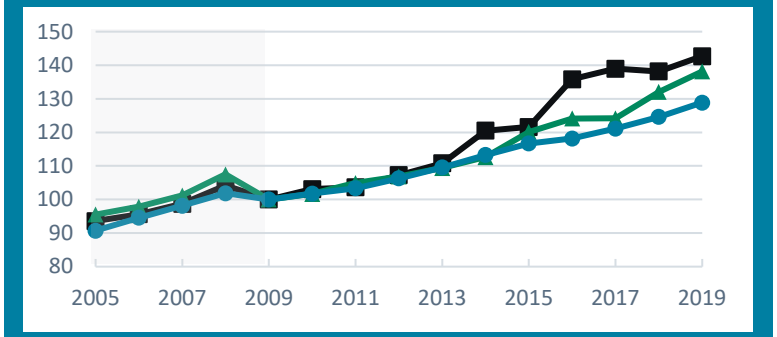
Tourism has been steadily declining since 2014, driven by a reduction in Visiting Friends and Relatives as Holidays and Business visits have remained consistently low.

Ebbsfleet + Gravesend

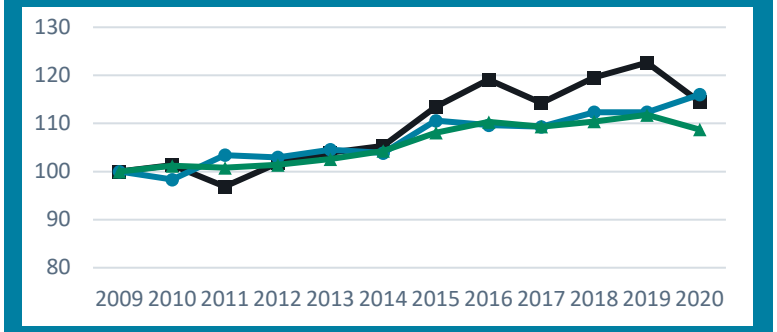
2 trains per hour, 51 minutes to London -> 4 trains per hour, 19 minutes to London

Ebbsfleet | Rest of the South East | Rest of Kent (excluding HS1 areas)

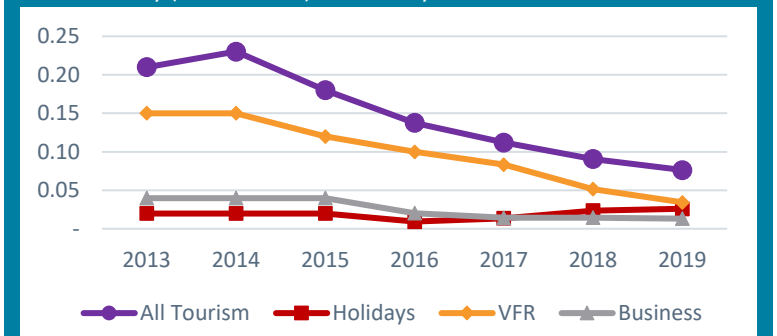
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Folkestone and Dover

All data indexed to 2009

1 train per hour, 81-93 minutes to London -> 1 train per hour, 51-64 minutes to London (35% decrease)

Folkestone and Dover | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

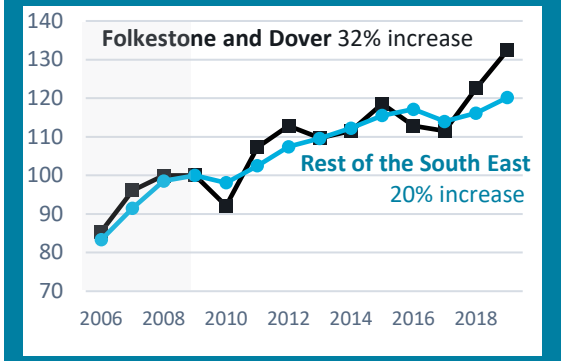
- Usage of Folkestone and Dover stations has increased above the average for the South East.
- There was a much larger rate of increase in travel to the area from London than the increase from London to elsewhere in the South East.
- Population growth has been close to the regional average.
- Employment has decreased significantly since 2012.

Usage of Dover, Folkestone Central and Folkestone West stations increased above the rest of the South East from 2017, having previously been in line with the general trend. There was a larger increase in travel from London to the area than in other flows, particularly after 2017.

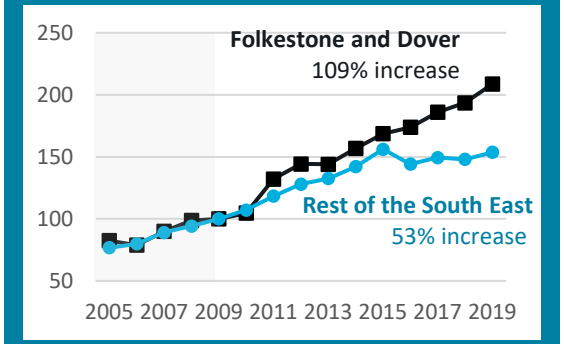
Population growth was in line with the rest of Kent and the South East. There was no clear difference between the smaller area around the station and the wider 4,000m radius.

Employment growth is below the regional average, dropping in 2012 and then remaining stagnant.

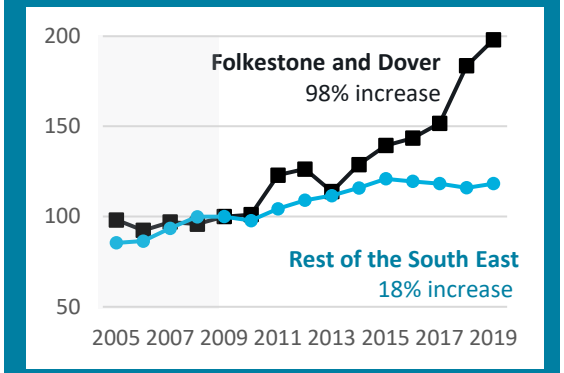
Station usage

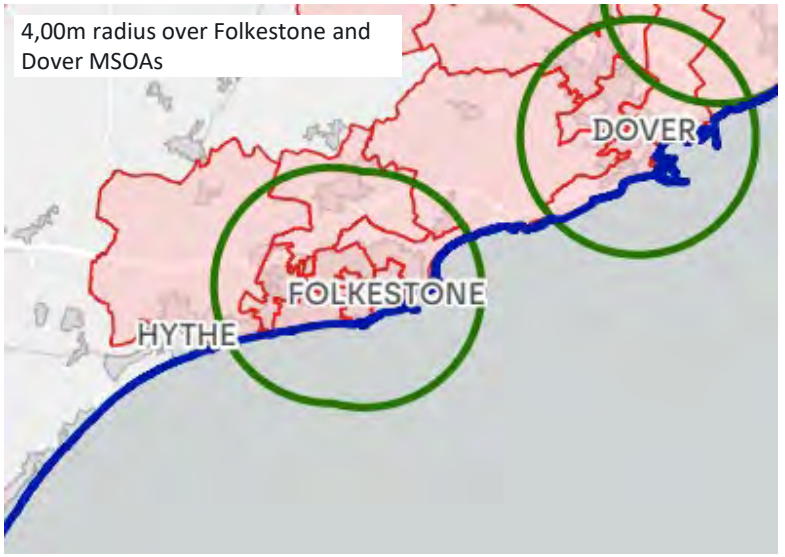


Rail journeys to London stations

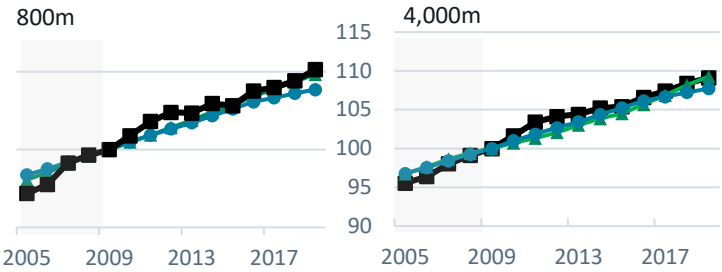


Rail journeys from London Stations

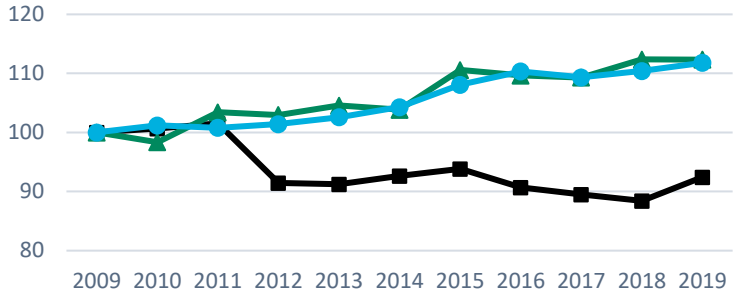




Population in station radiuses



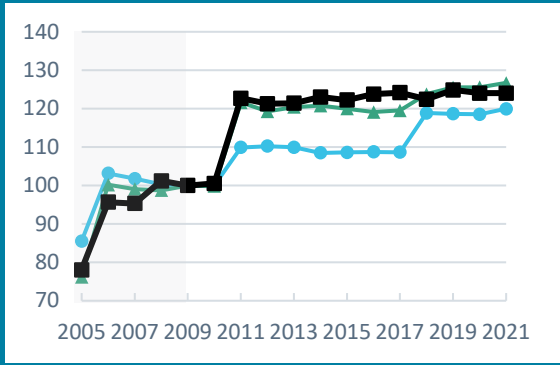
Employment in 4000m station radius



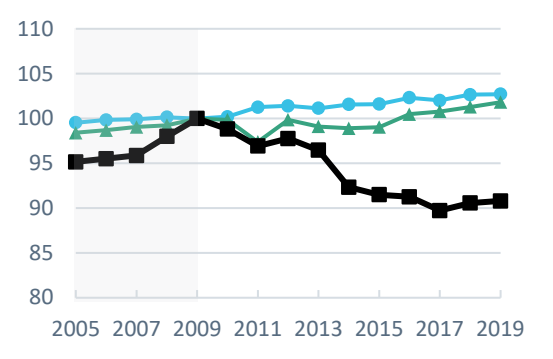
Folkestone and Dover

1 train per hour, 81-93 minutes to London -> 1 train per hour, 51-64 minutes to London (35% decrease)
All charts indexed to 2009

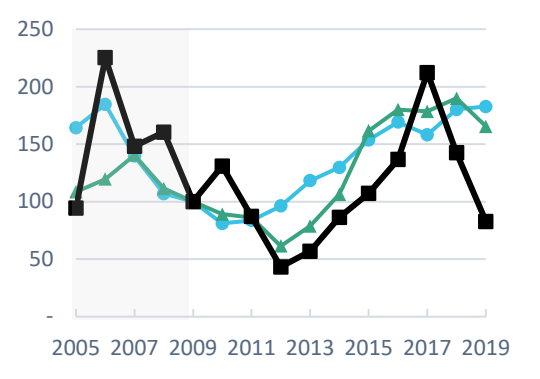
Commercial rateable value per sqm



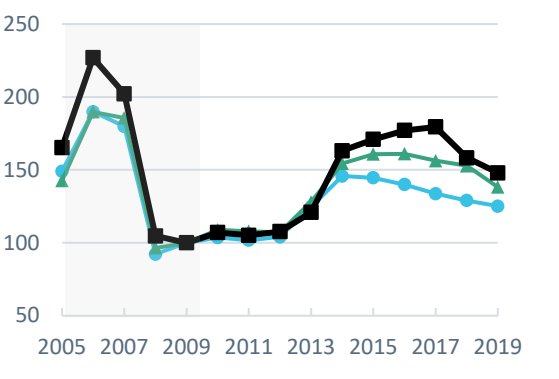
Commercial floorspace (sqm)



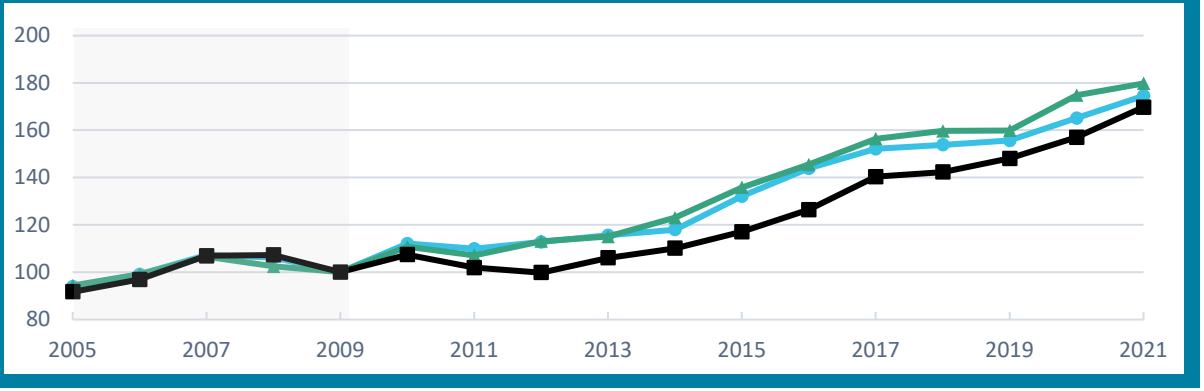
New build residential transaction volumes



Residential transaction volumes



Median residential sale prices



Folkestone and Dover
Rest of the South East
Rest of Kent (excluding HS1 areas)

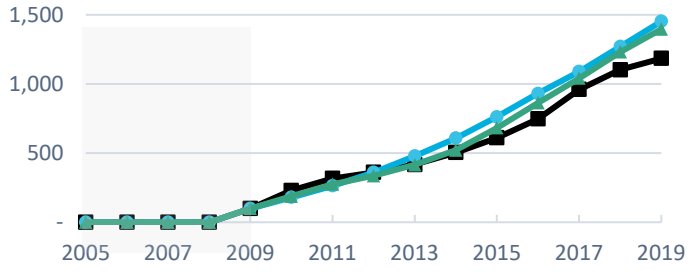
Rateable values for commercial property have been largely flat over this period, in line with the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has dropped significantly (3%) from 2012 onwards. This is significantly different from the trend in the rest of Kent and the South East.

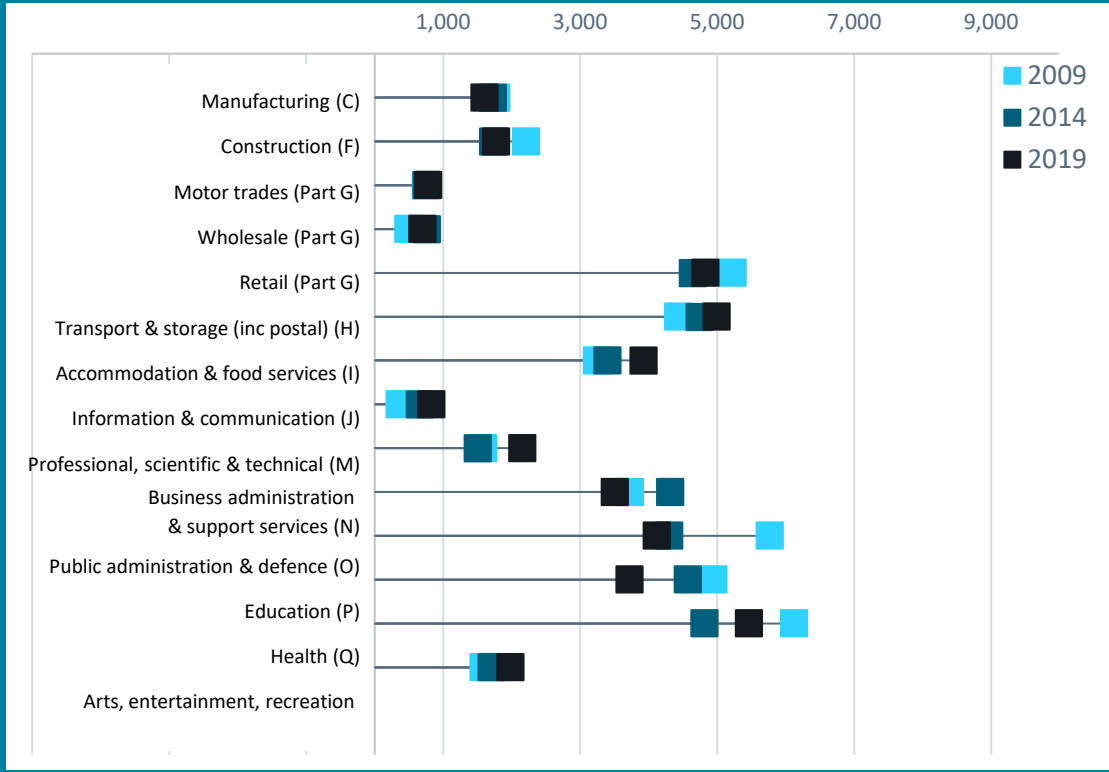
The volume of **residential property sales** is broadly in line with the average in Kent and the South East. However, there are cumulatively fewer new build sales.

The trend in **prices paid for residential property** is slightly below the average for the region.

Cumulative new build residential transactions



Change in employment sectors in Folkestone and Dover (2009 – 2019)



GVA growth per capita was below the average for the rest of Kent and the South East.

Employment in this area declined in 2012 and remained largely flat from then on. There are no large differences within sectors, although there was a 1600 people decrease in employees in public administration and defence.

Tourism to Dover peaked in 2016 and has declined since.

Folkestone and Dover

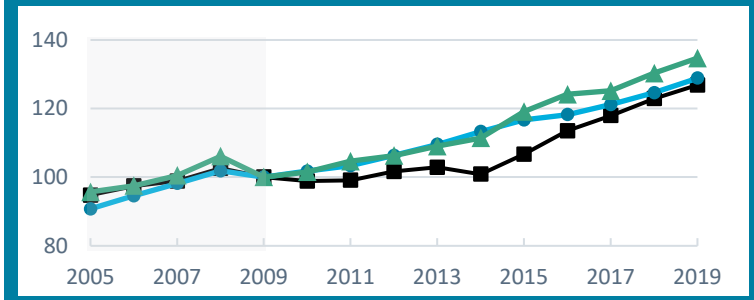
1 train per hour, 81-93 minutes to London -> 1 train per hour, 51-64 minutes to London (35% decrease)

Folkestone and Dover

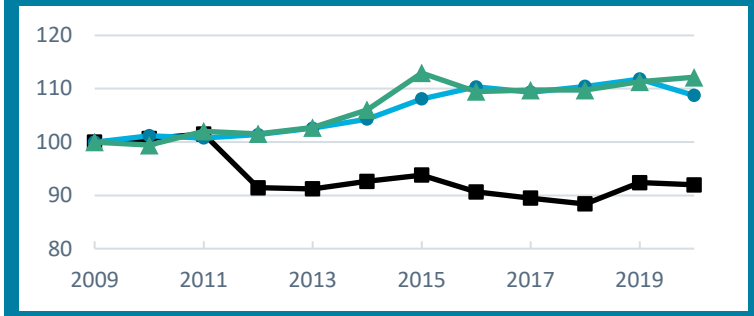
Rest of the South East

Rest of Kent (excluding HS1 areas)

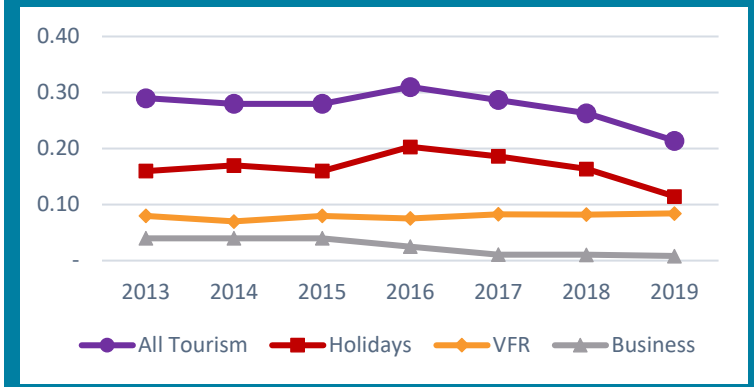
GVA per capita



Employment



Visitor activity in Dover (million visits) – data only available from 2013



Maidstone

All data indexed to 2009

No direct service -> 1 peak train per hour, 50 minutes to London

Maidstone | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

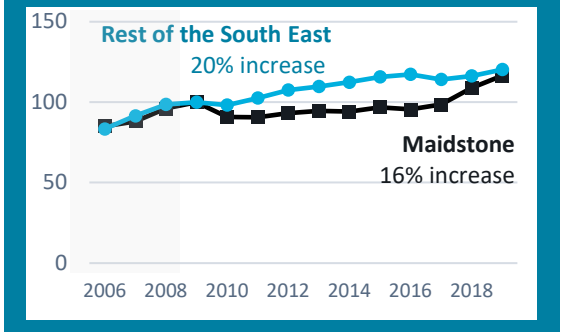
- Usage of Maidstone stations has increased below the average for the South East, from 2010 onwards.
- However, the volume of journeys to and from London has been largely flat.
- Population growth is above the trend for both Kent and the wider South East, and growth was even higher in the immediate area of the station.
- Employment growth is below the regional average.

Usage of Maidstone stations (East, West and Barracks) increased below the rest of the South East over the period. Growth to and from London was very low, with a decrease in journeys to Maidstone from London.

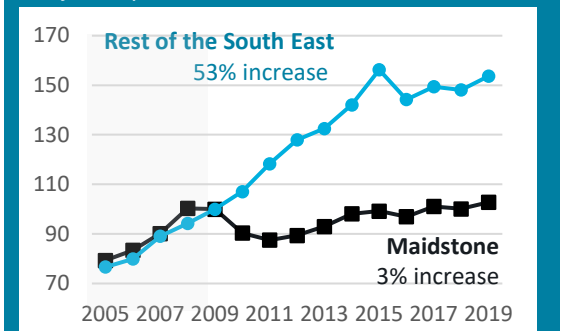
Population growth was above the wider trend for the South East and the rest of Kent, and the difference was larger in the central area within 800m of the station. This high population growth within walking distance of the station means that HS1 could be a factor in the decision to locate there.

Employment growth has been consistently lower than the regional average since 2010.

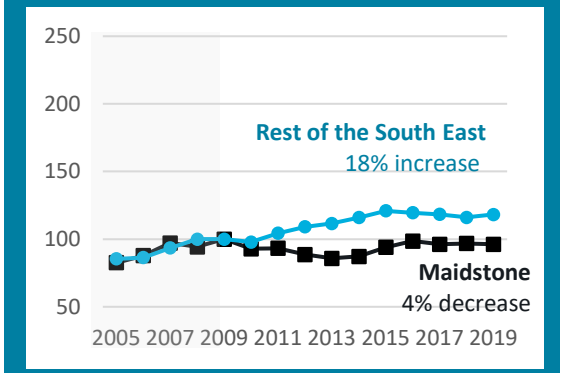
Station usage

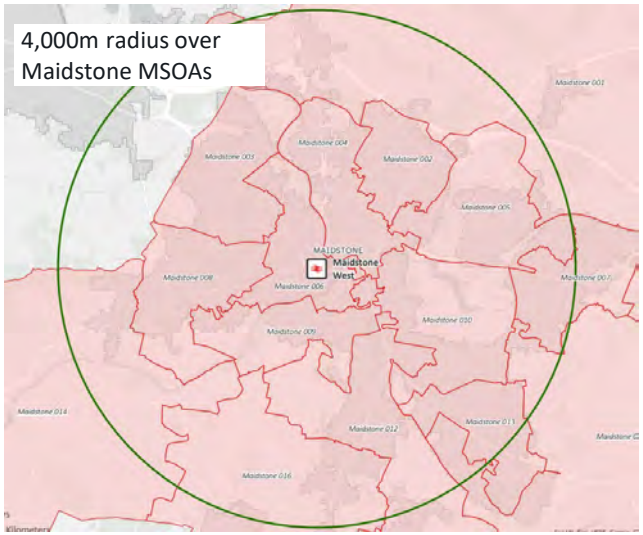


Rail journeys to London stations

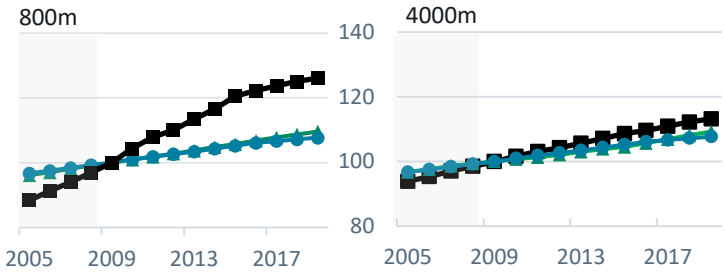


Rail journeys from London Stations

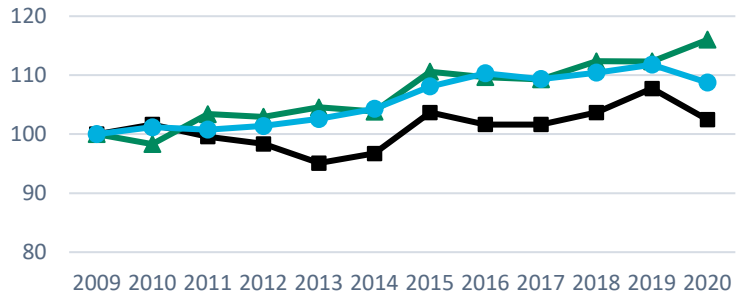




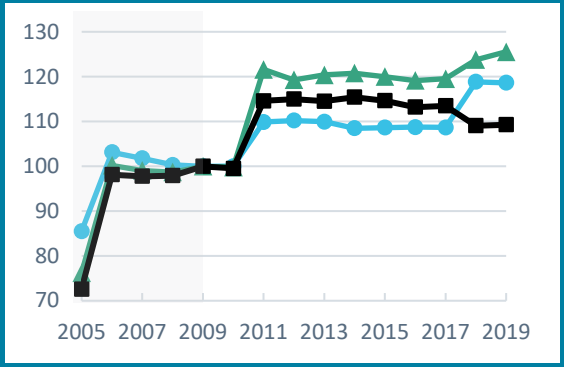
Population in station radiuses



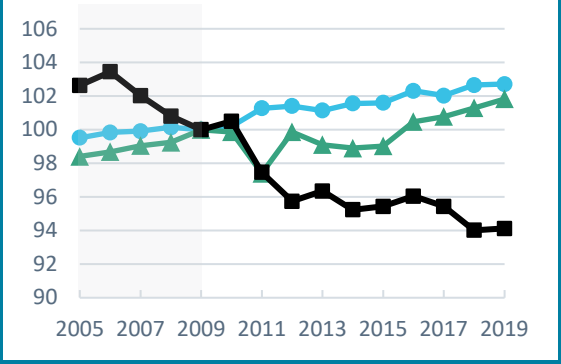
Employment in 4000m station radius



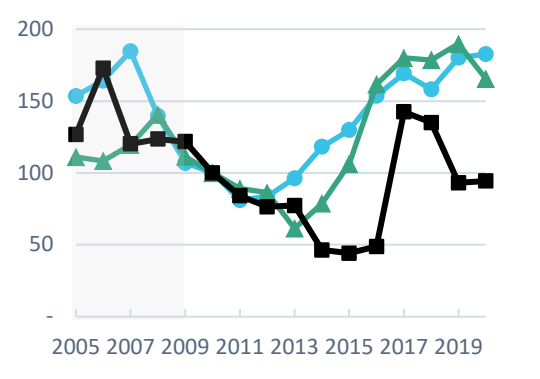
Commercial rateable value per sqm (indexed to 2009)



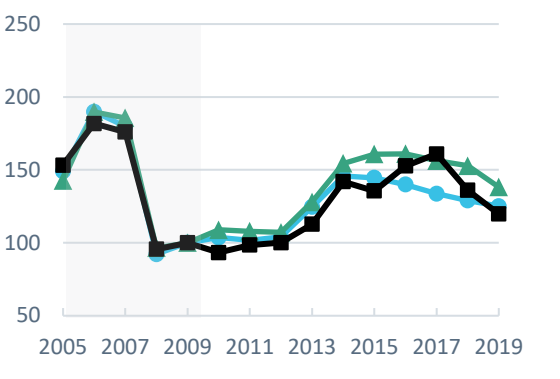
Commercial floorspace (sqm) (indexed to 2009)



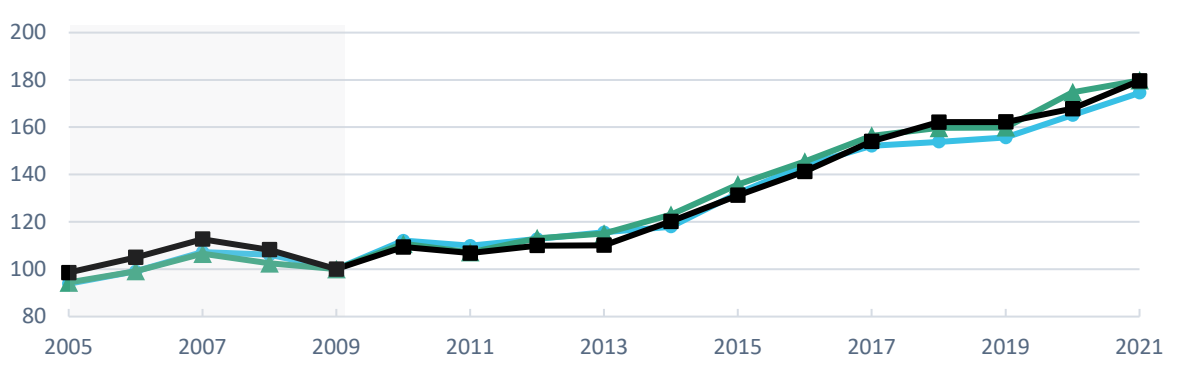
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Maidstone

No direct service -> 1 peak train per hour, 50 minutes to London

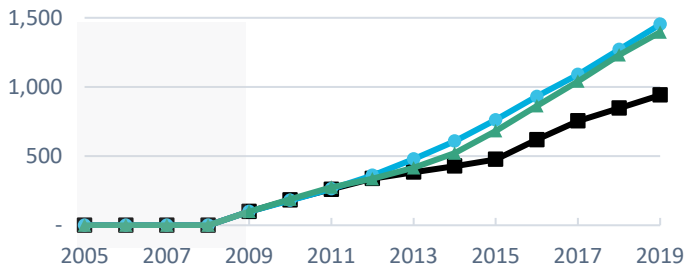
Maidstone | Rest of the South East | Rest of Kent (excluding HS1 areas)

Rateable values for commercial property have dropped in recent years, and have generally been in between the trend for the South East and for Kent. This is despite the fact that **commercial floorspace** has shrunk by about 5% between 2009-2019.

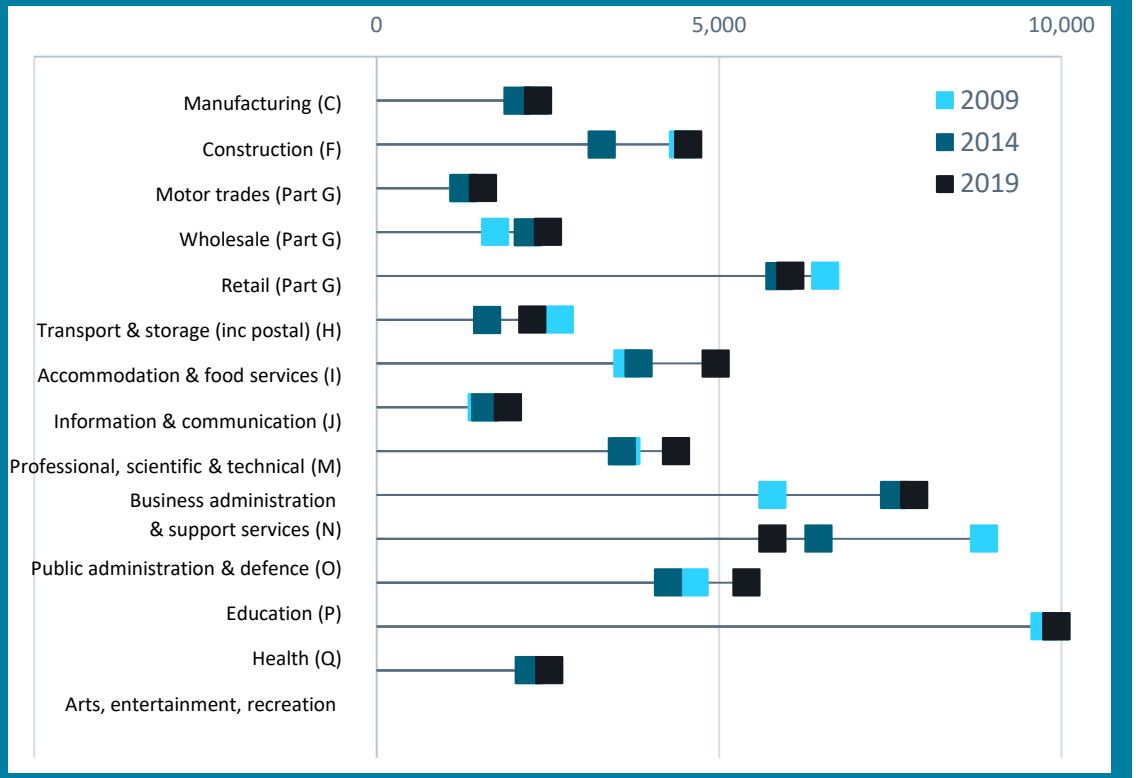
Residential property sales follow a similar trend to the rest of the South East and Kent. However, new build sales are lower than the rest of the region.

The trend in **prices paid for residential property** is very similar to the regional trend.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Maidstone (2009 – 2019)



GVA growth per capita was below the trend in Kent and the rest of the South East, but growing at a similar rate.

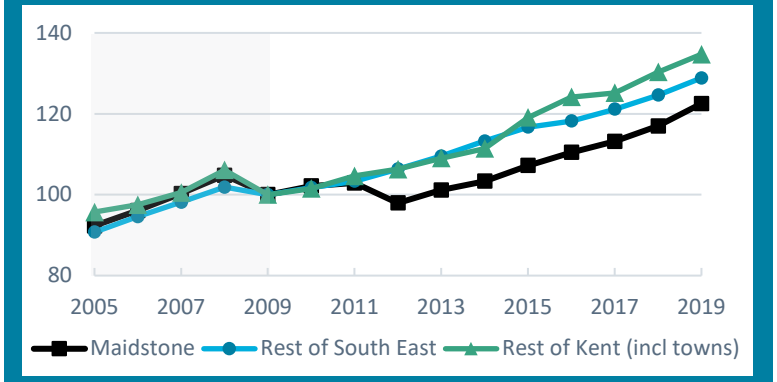
Employment in this area increased by 2% between 2009 and 2019, less than the regional trend. there were substantial increases in employment in the business administration and support sector (over 2000 additional jobs) whereas employment in public administration decreased by around 3000 jobs.

Tourism to Maidstone declined until 2015 but has then been broadly flat.

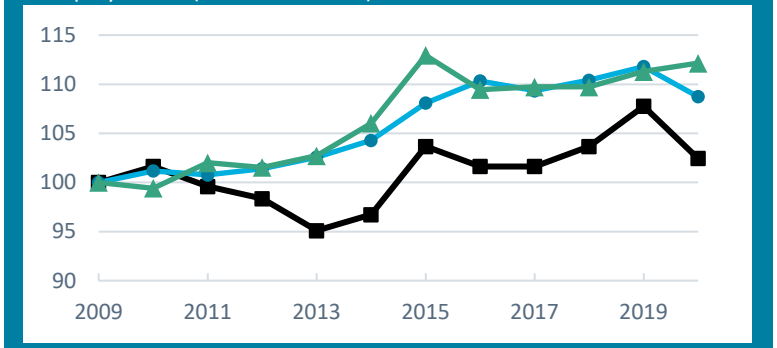
Maidstone

No direct service -> 1 peak train per hour, 50 minutes to London

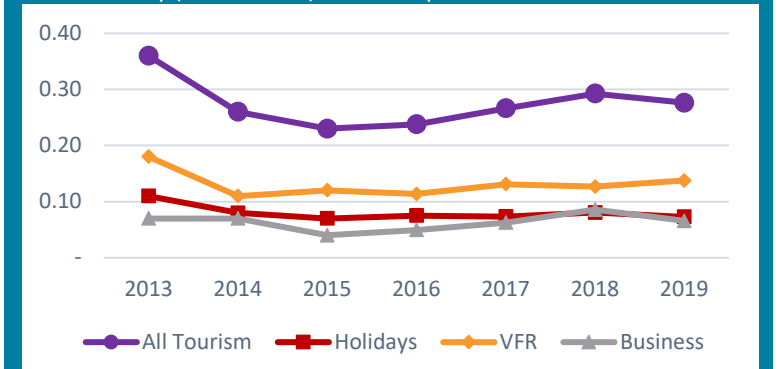
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Medway

All data indexed to 2009

2 trains per hour. 40-63 minutes to London -> 2 trains per hour, 34-47 minutes to London (18% decrease)

Medway | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

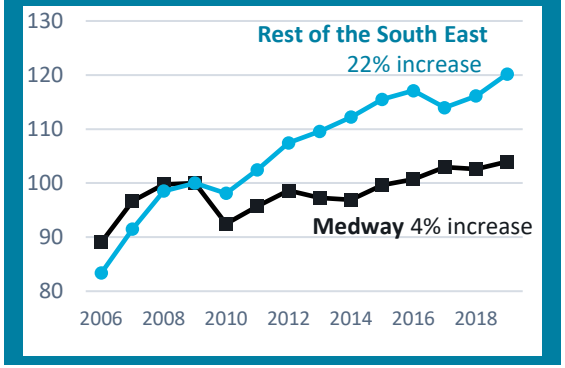
- Usage of Medway stations (Chatham, Gillingham, Rainham, Rochester and Strood) has increased below the average for the South East, growing only by 4% over the period.
- Rail journeys to London have grown at a slow pace while journeys from London have grown more erratically.
- Population and employment growth is very similar to the regional average.

Usage of Medway stations (Chatham, Gillingham, Rainham, Rochester and Strood) increased below the general trend in the South East. Rail journeys to London stations have grown slowly but steadily with only an 8% increase since 2009 compared to the regional average of 53%. Rail journeys from London was closer to the regional average of 18% since 2009 at 11% despite more dramatic year on year fluctuations.

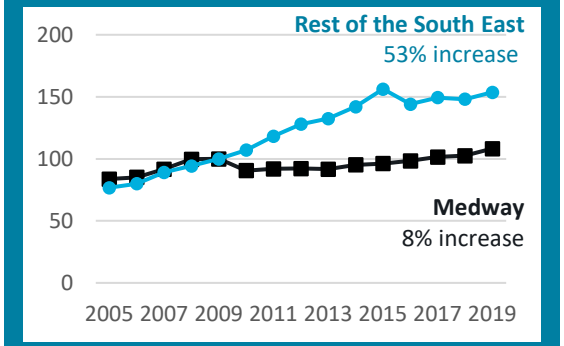
Population growth was close to the regional average, with no clear trend and only a 3% difference in growth at a 4,000m level in 2019.

Employment growth is close to the regional average, with no clear trend.

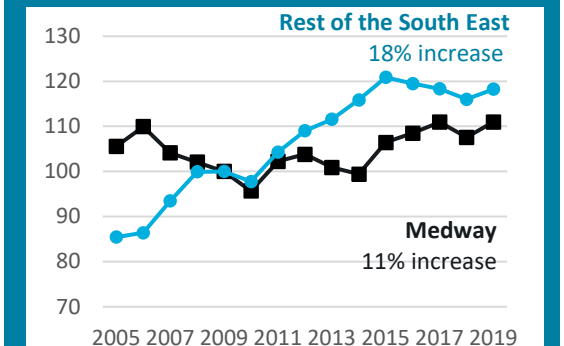
Station usage (indexed to 2009)

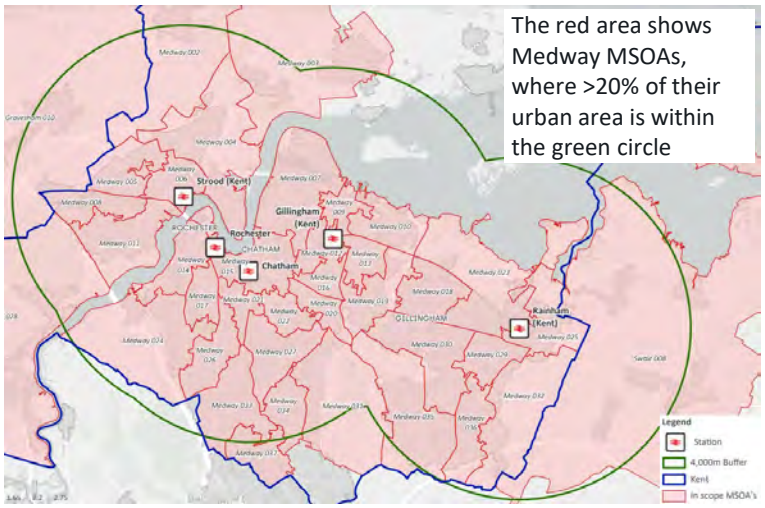


Rail journeys to London stations (indexed to 2009)

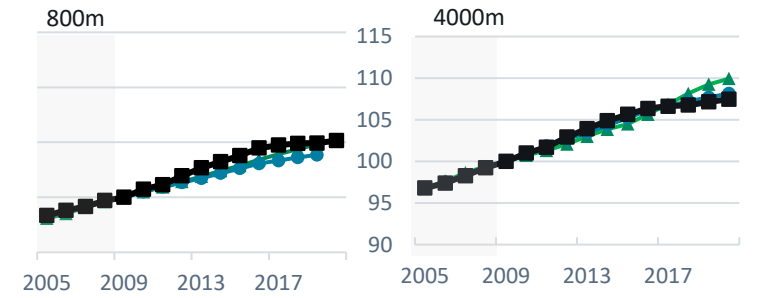


Rail journeys from London Stations (indexed to 2009)

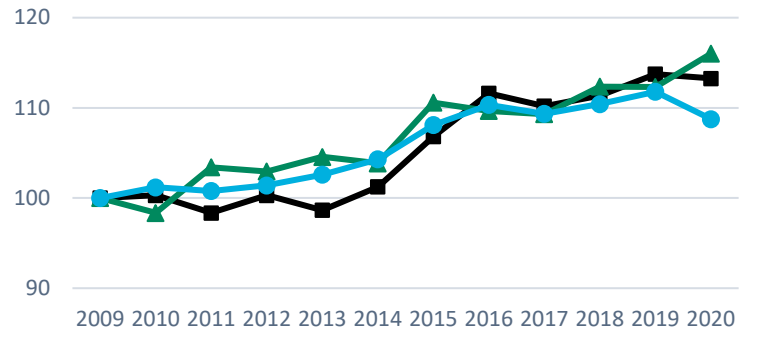




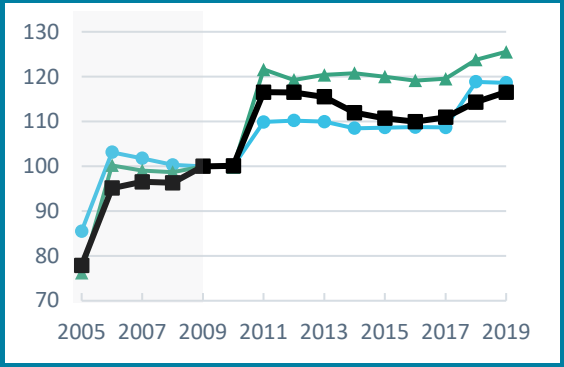
Population in station radiuses (indexed to 2009)



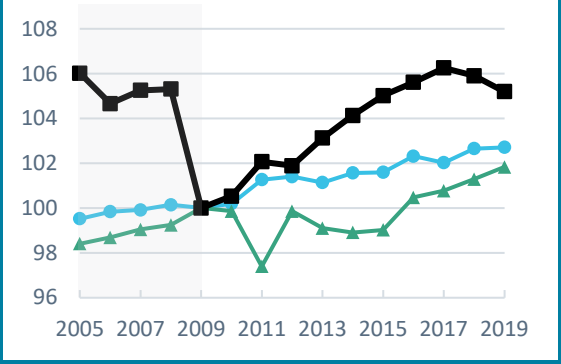
Employment in 4000m station radius (indexed to 2009)



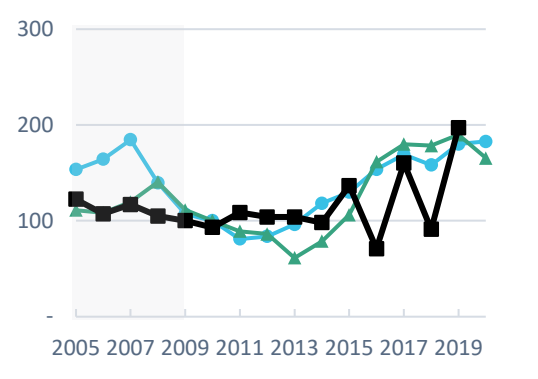
Commercial rateable value per sqm (indexed to 2009)



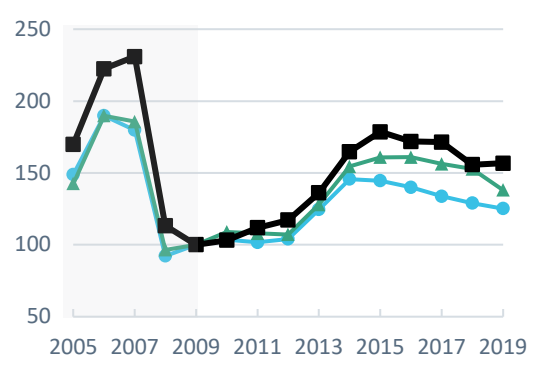
Commercial floorspace (sqm) (indexed to 2009)



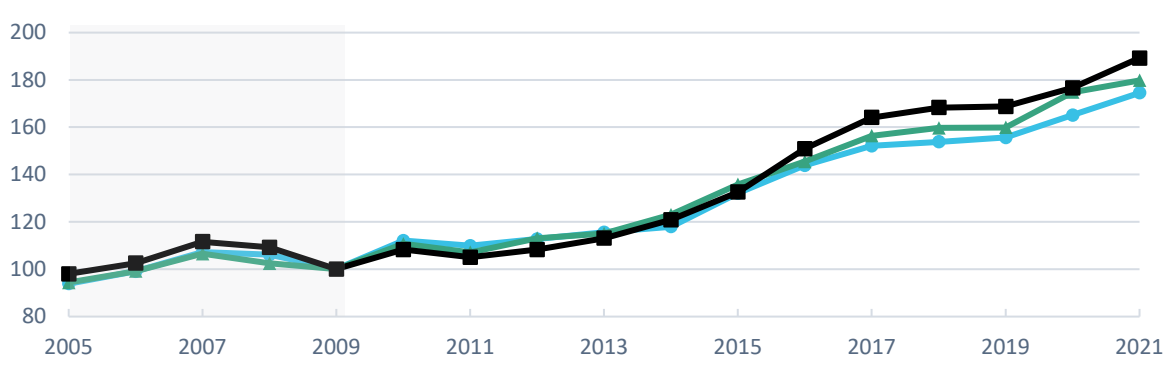
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Medway

2 trains per hour. 40-63 minutes to London -> 2 trains per hour, 34-47 minutes to London (18% decrease)

Medway | Rest of the South East | Rest of Kent (excluding HS1 areas)

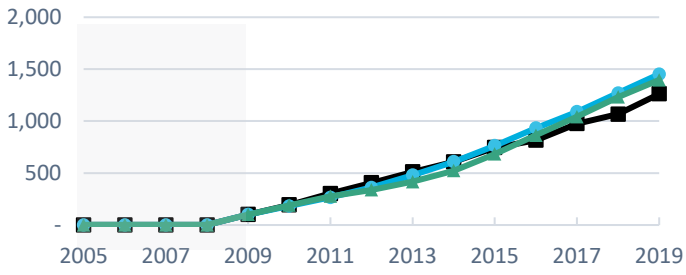
Rateable values for commercial property have been largely flat over this period, in line with the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has grown by 5% from 2009-2019, above the rate in the rest of the South East and Kent. This peaked in 2017.

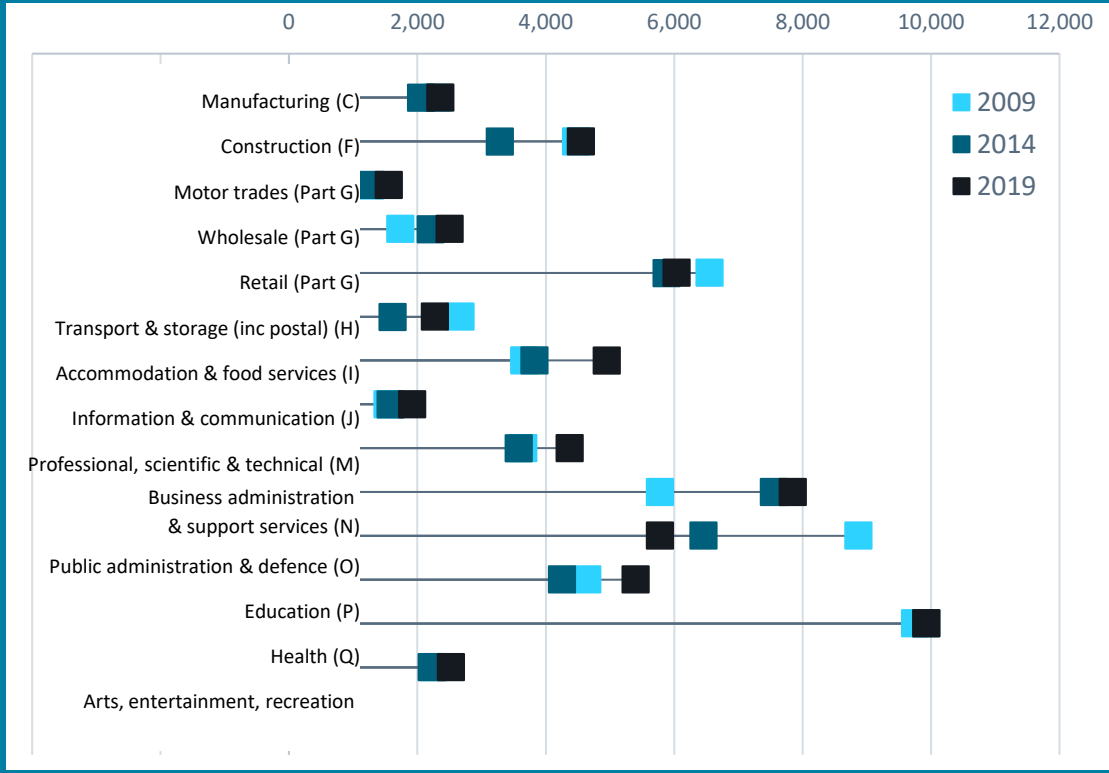
The growth in **residential property sales** in Medway is slightly above the average for the region. However, new build transactions are unusually volatile compared to other areas, and the overall volume is below the trend for other areas.

The trend in **prices paid for residential property** is slightly above the general trend in Kent and the rest of the South East.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Medway (2009 – 2019)



GVA growth per capita was in line with the trend in the rest of the South East, but below the rest of Kent.

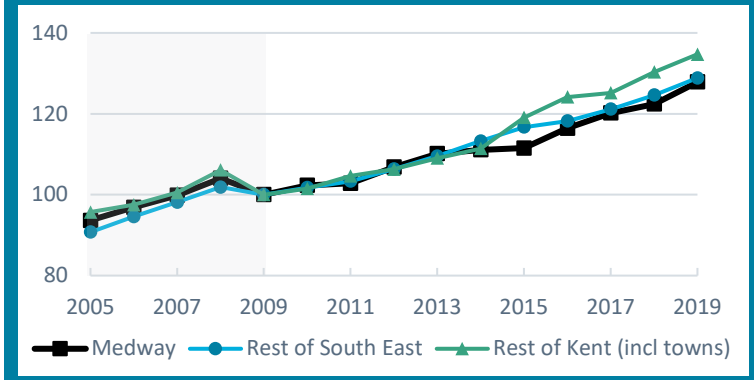
Employment in this area increased by 13% between 2009 and 2019, similar to the rest of the region: there were increases in several sectors, notably Business Administration (increased by 2000 jobs) and Accommodation and Food Service (increased by around 1000 jobs). There was a large (3000 job) decrease in Public Administration, with smaller drops in Transport and Retail.

Tourism to the Medway area was flat over the period from 2013-2019.

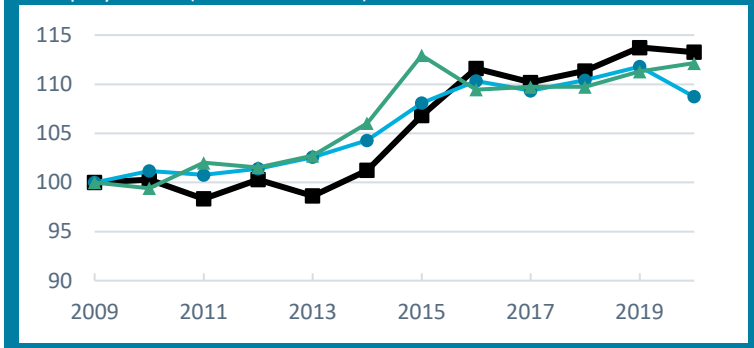
Medway

2 trains per hour. 40-63 minutes to London -> 2 trains per hour, 34-47 minutes to London (18% decrease)

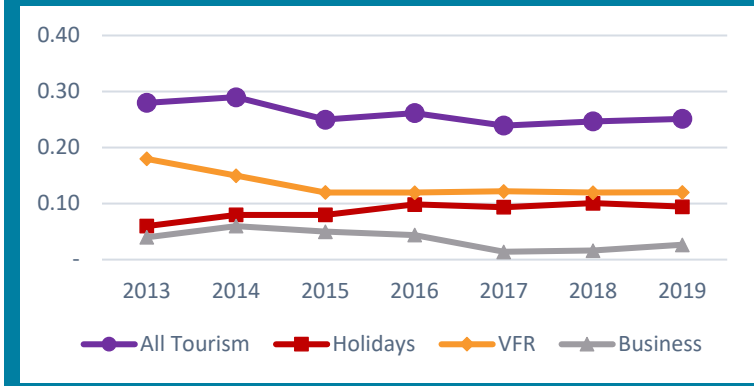
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Rural Kent Coast

All data indexed to 2009

1 train per hour, 102-117 minutes to London -> 1 trains per hour, 74-88 minutes to London (27% decrease)

Kent Coast | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

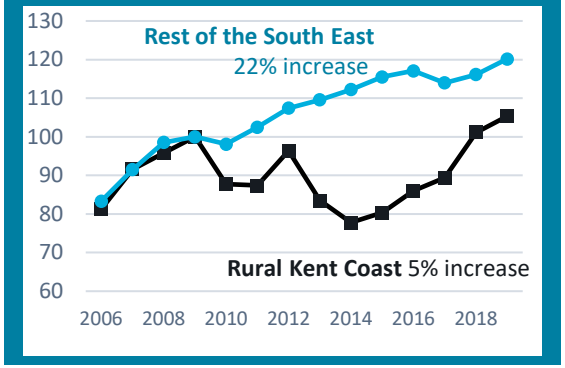
- Usage of stations on the rural Kent coast to and from London has grown substantially from 2015 onwards.
- There was limited growth in use of the station overall.
- Population growth and employment growth has remained lower than the regional averages.

Usage of rural Kent Coast stations (Deal, Martin Mill, Sandwich and Walmer) increased substantially above the rest of the South East from 2015 onwards, to and from London. This was not reflected in wider use of the station which has grown at a consistently slower rate than the regional average at only 5% since 2009 compared to 20% in the rest of the South East.

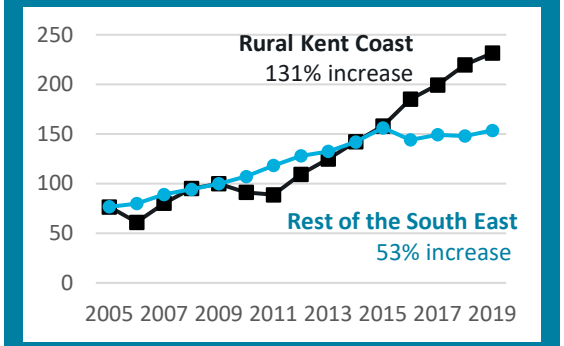
Population growth was below the wider trend for the South East and the rest of Kent, and the difference was larger in the immediate area within 800m of the stations, growing only 1% since 2019, compared to 10% in the rest of Kent. There was substantial increase in the number of new build houses sold in 2015 and 2016, coinciding with the increase in travel.

Employment growth is below the regional average, with no clear trend. The population in the area is increasingly elderly, which could drive these trends.

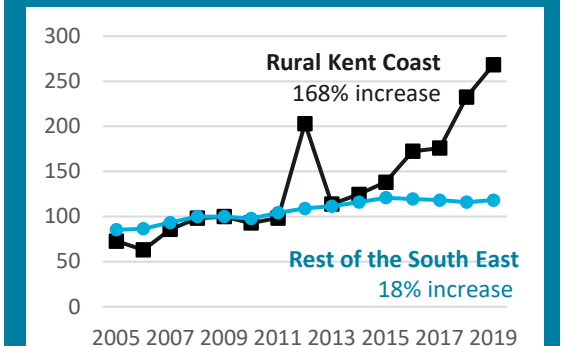
Station usage (indexed to 2009)

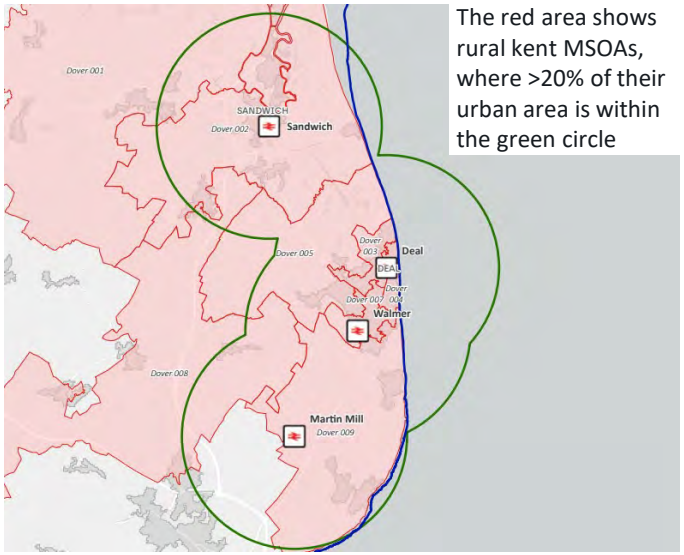


Rail journeys to London stations (indexed to 2009)



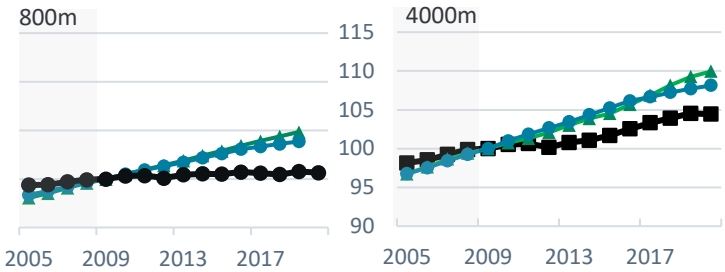
Rail journeys from London Stations (indexed to 2009)



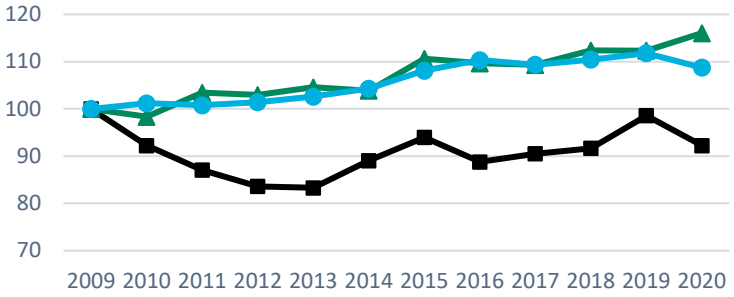


The red area shows rural kent MSOAs, where >20% of their urban area is within the green circle

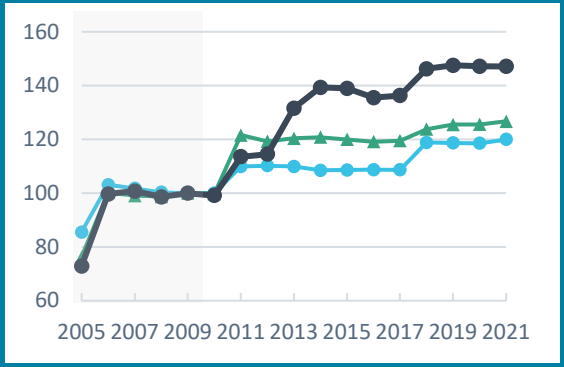
Population in station radiuses (indexed to 2009)



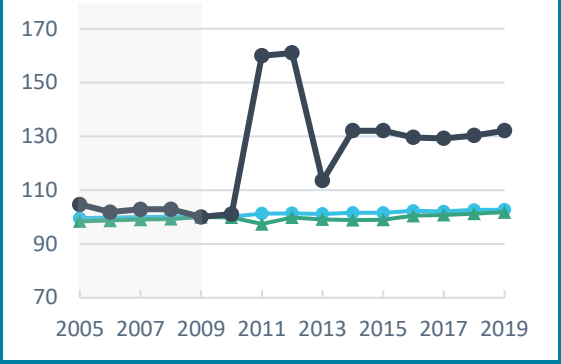
Employment in 4000m station radius (indexed to 2009)



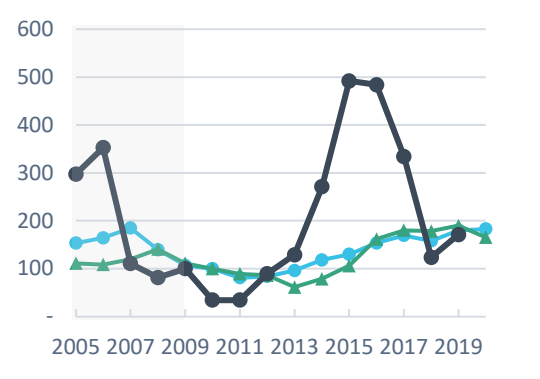
Commercial rateable value per sqm (indexed to 2009)



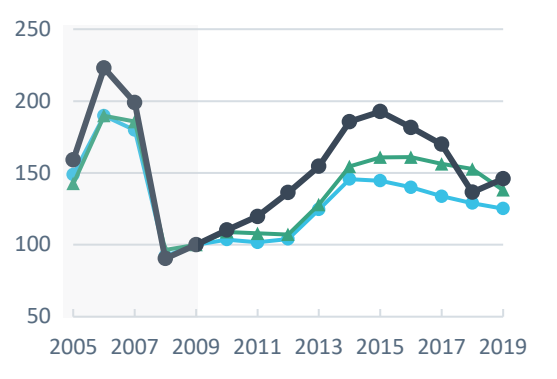
Commercial floorspace (sqm) (indexed to 2009)



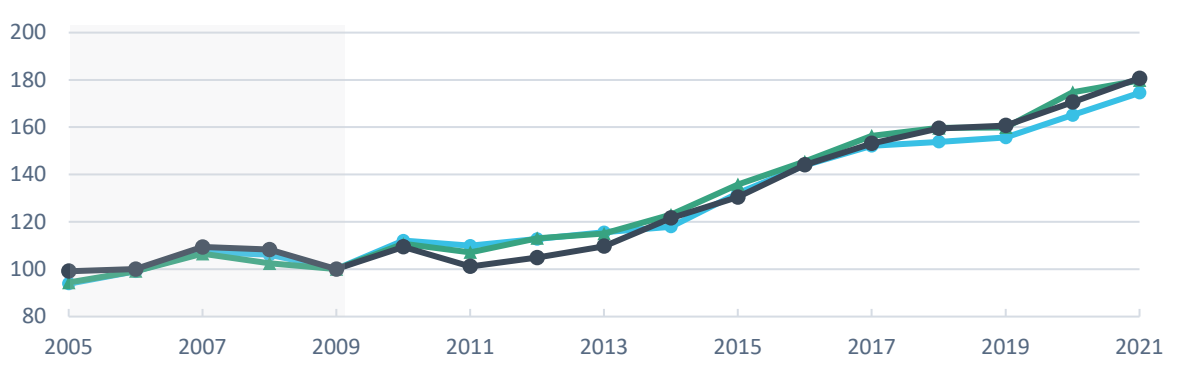
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Rural Kent Coast

1 train per hour, 102-117 minutes to London -> 1 trains per hour, 74-88 minutes to London (27% decrease)

Rural Kent Coast

Rest of the South East

Rest of Kent (excluding HS1 areas)

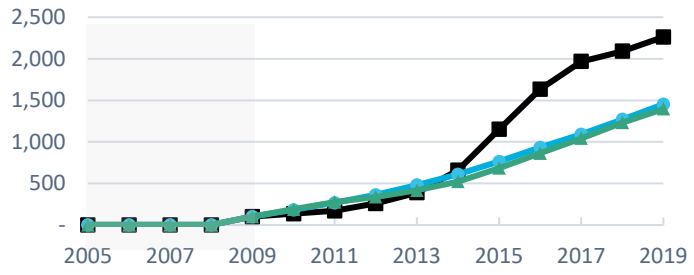
Rateable values for commercial property have increased over this period, about the trend in the rest of the South East and Kent.

Commercial floorspace has grown substantially (32%) over the period between 2009-2019. There was a peak in commercial floorspace and in travel from London in 2012 – there is no clear single reason for this, but there was a substantial tourism campaign around the 2012 Olympics. The population in this area is also quite small, so some volatility in the data is to be expected.

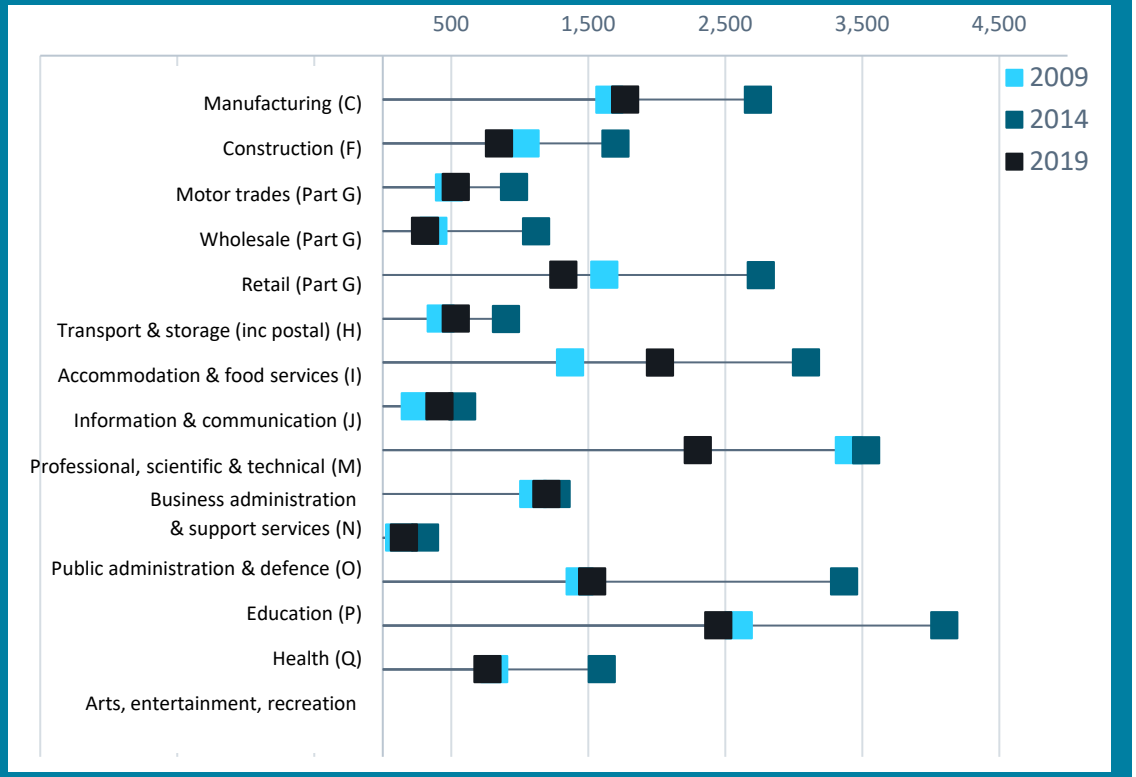
Residential property sales in the rural Kent coast grew slightly higher than the Kent and South East averages. New build sales were well above the average for the region between 2013-2017, although this is likely to be a reflection of low volume making percentage changes seem more dramatic.

The trend in **prices paid for residential property** is very similar to the trend in Kent and the South East.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Rural Kent Coast (2009 – 2019)



GVA growth per capita was below the rate for the rest of Kent and the South East.

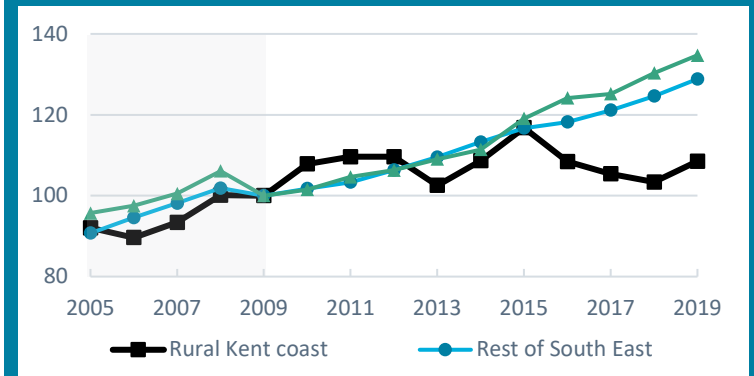
Employment in this area decreased by 8% between 2009 and 2019: there were decreases in all sectors, but the largest were in Professional and Technical Services (decreasing by 1200 jobs) and Health (decreasing by 1500 jobs).

Tourism to the area has remained mostly unchanged over the period between 2013 and 2019.

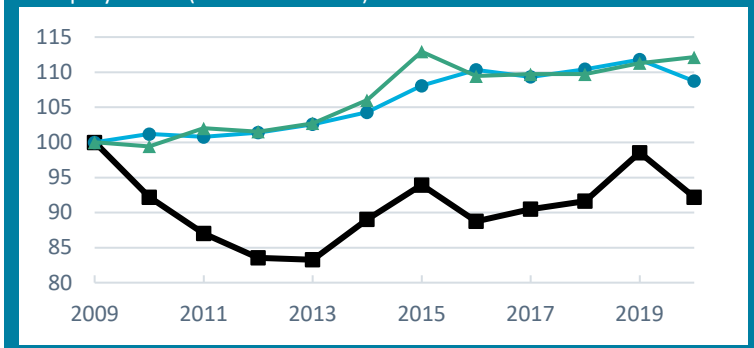
Rural Kent Coast

1 train per hour, 102-117 minutes to London -> 1 trains per hour, 74-88 minutes to London (27% decrease)

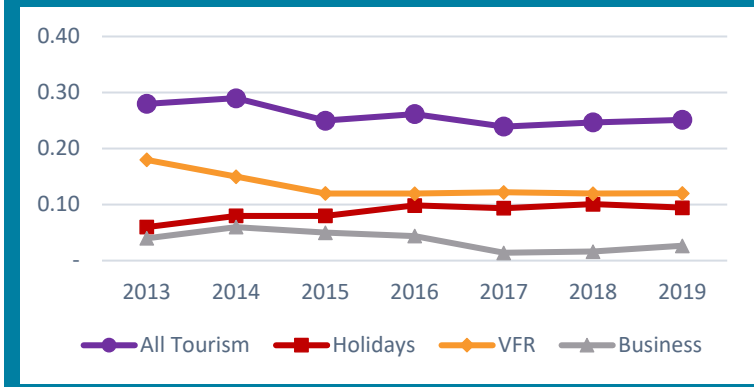
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Sittingbourne and Faversham

All data indexed to 2009

2 trains per hour, 60-68 minutes to London -> 2 trains per hour, 55-63 minutes to London (8% decrease)

Ashford | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

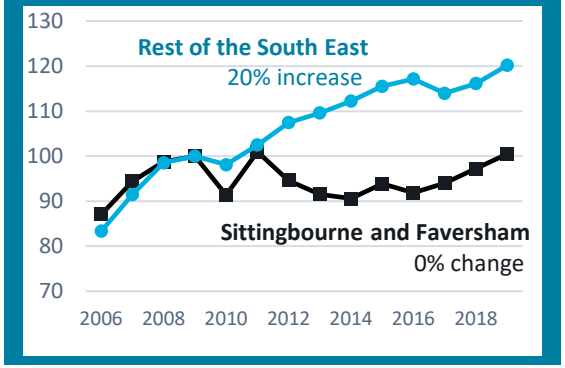
- Usage of Sittingbourne and Faversham stations did not grow overall from 2009-2019.
- Travel from London to Sittingbourne and Faversham grew in line with the regional average for the South East.
- Population and employment growth was slightly above the average for Kent and the South East.

Usage of Sittingbourne and Faversham stations remained far below the regional average and has grown 0% overall in the 10 years since 2009, after a 10% decrease in the first five years since 2009 and a 10% recovery in the last five years.

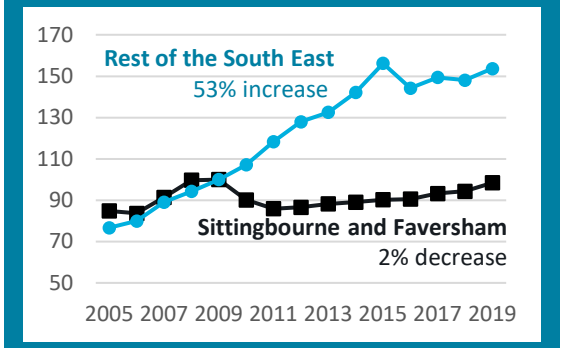
Population growth increased at a similar rate to the regional averages across both 800m and 4,000m levels, growing by 10% since 2009.

Employment growth has grown faster than the regional averages since 2009 but has taken a downturn in recent years since 2019, aligning with the shrinking employment in the rest of the South East.

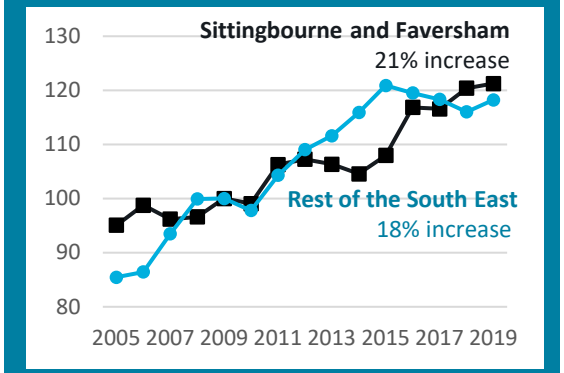
Station usage (indexed to 2009)

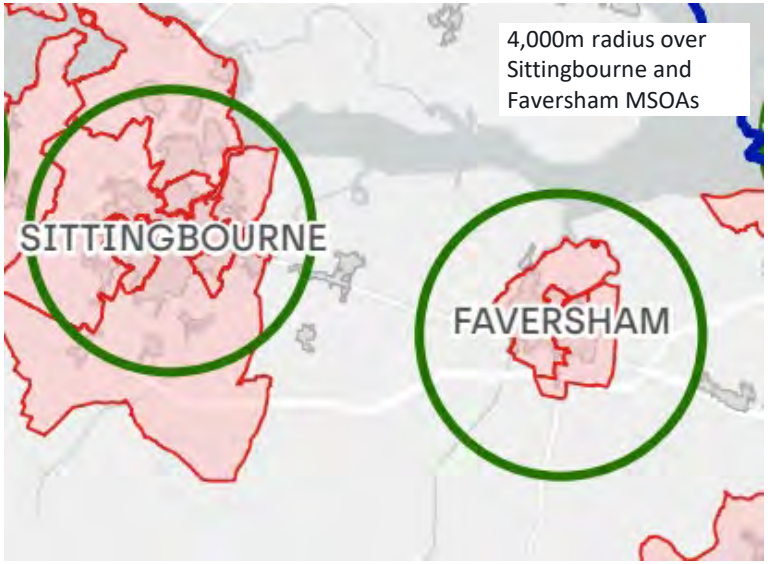


Rail journeys to London stations (indexed to 2009)

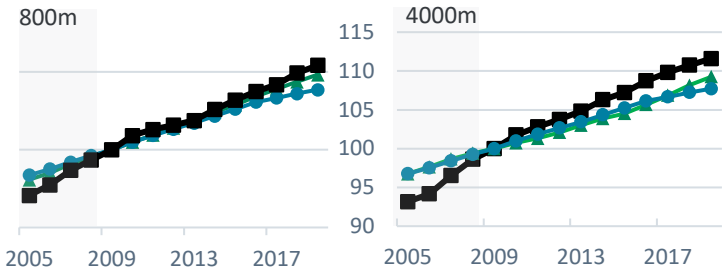


Rail journeys from London Stations (indexed to 2009)

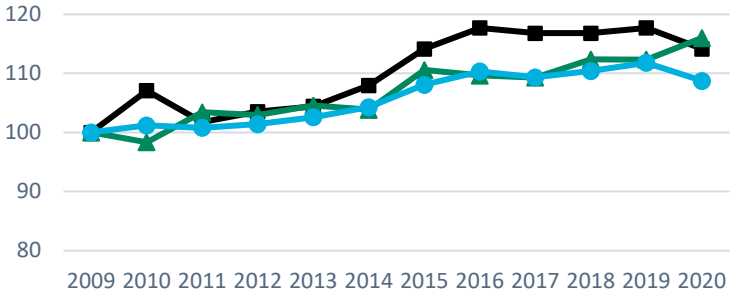




Population in station radiuses (indexed to 2009)



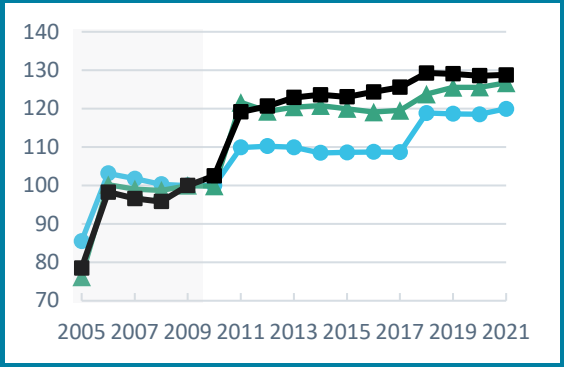
Employment in 4000m station radius (indexed to 2009)



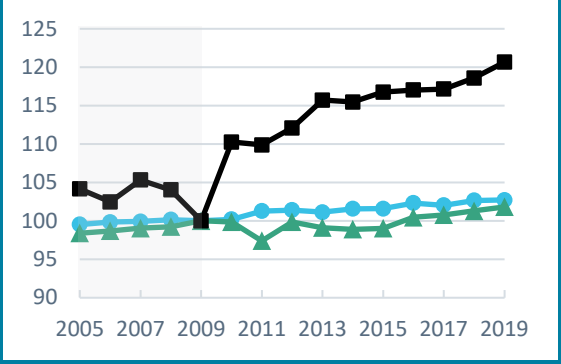
Sittingbourne and Faversham

2 trains per hour, 63 minutes to London -> 2 trains per hour, 36 minutes to London (43% decrease)

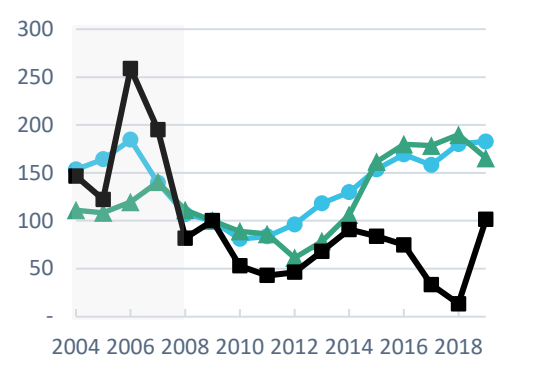
Commercial rateable value per sqm (indexed to 2009)



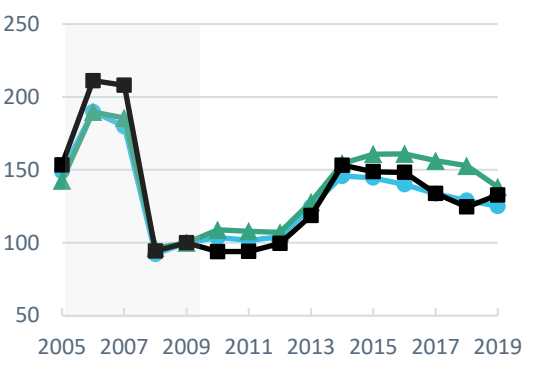
Commercial floorspace (sqm) (indexed to 2009)



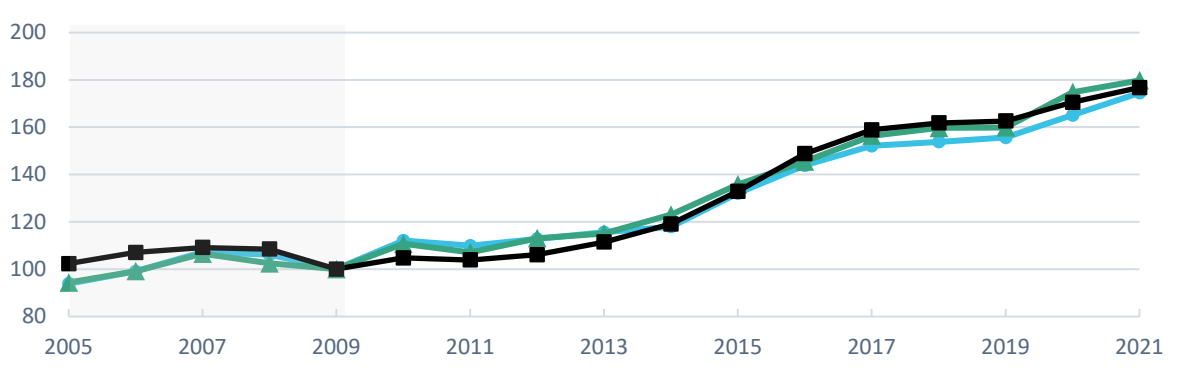
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Sittingbourne and Faversham

Rest of the South East

Rest of Kent (excluding HS1 areas)

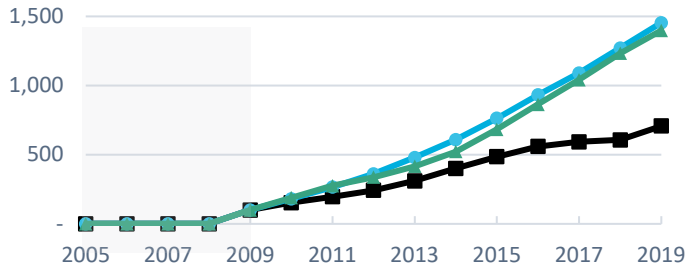
Rateable values for commercial property have been largely flat over this period, slightly above the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has grown substantially since 2009. 2009 appears to be an unusually low point in the data, so the extent of the change is magnified, but it is still substantially (15%) above the level in previous years.

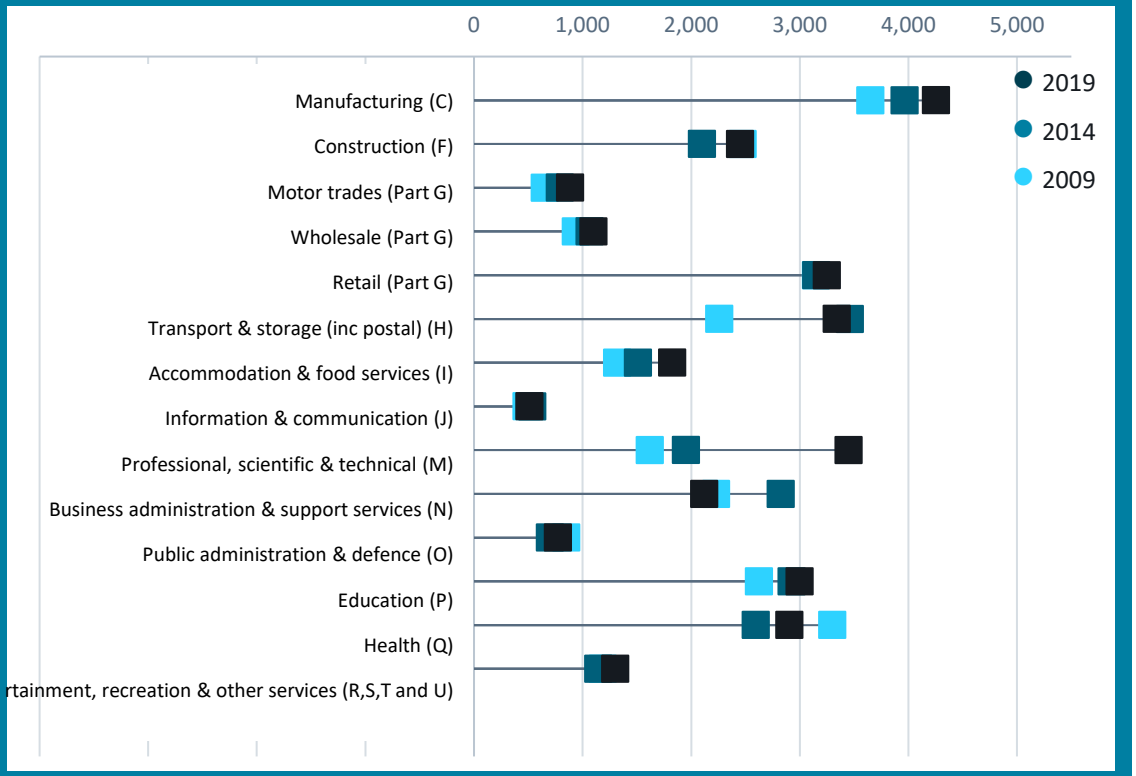
Residential property sales in Sittingbourne and Faversham are largely in line with the general trend in the South East and Kent. However, new build sales are more volatile, and cumulatively much lower than the regional trend.

The trend in **prices paid for residential property** is highly correlated with the general trend in Kent and the rest of the South East.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Sittingbourne and Faversham (2009 – 2019)



GVA growth per capita in Sittingbourne and Faversham was below the trend in Kent and the South East.

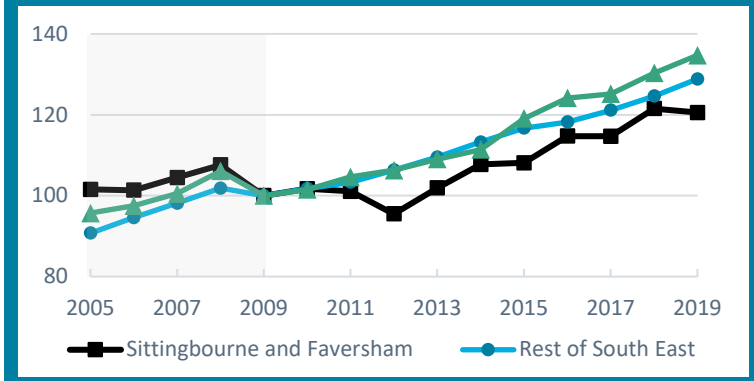
Employment in this area increased by 14% between 2009 and 2019: there were increases in employment in the Professional, Scientific and Technical Sectors (1800 additional jobs, more than doubling) and Manufacturing (800 additional jobs) sectors. Increases in these sectors would be expected to link to stronger GDP growth, however this isn't present in the data.

Tourism to Sittingbourne and Faversham peaked in 2015.

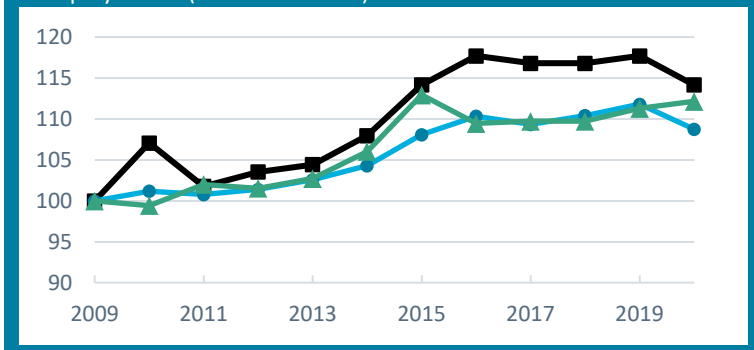
Sittingbourne and Faversham

2tph, 63 minutes to London -> 2 tph, 36 minutes to London (43% decrease)

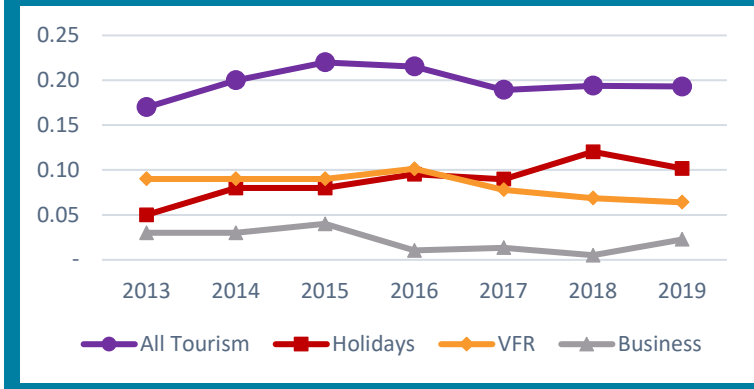
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity in Swale (million visits) – data only available from 2013



Thanet

All data indexed to 2009

2 trains per hour, 94-107 minutes to London -> 2 trains per hour, 74-87 minutes to London (19% decrease)

Ashford | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

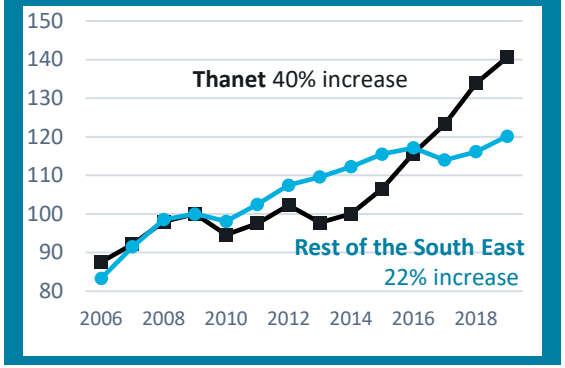
- Usage of Thanet stations increased substantially from 2014-15 onwards.
- Population growth was largely in line with the regional trends in Kent and the South East.
- Employment growth was below the regional average.

Usage of Thanet stations (Birchington-On-Sea, Broadstairs, Margate and Ramsgate) increased substantially above the rest of the South East from around 2015. Growth in travel from London was substantially higher than the regional average by 203% since 2009, reflecting the increased popularity of the region as a visitor destination. Rail journeys to London show a comparatively less dramatic growth rate, only 23% higher than the regional average since 2009.

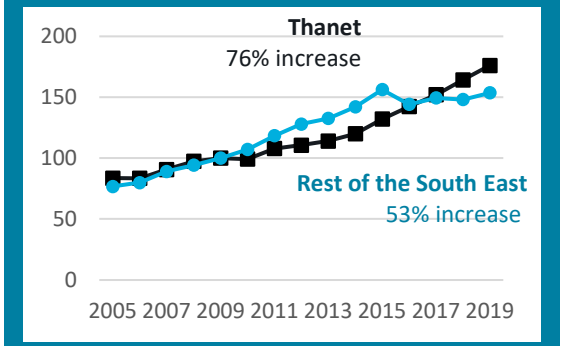
Population growth was around the same level as the wider trend for the South East and the rest of Kent, and the difference was larger in the immediate area within 800m of the station.

Employment growth is below the regional average, with no clear trend.

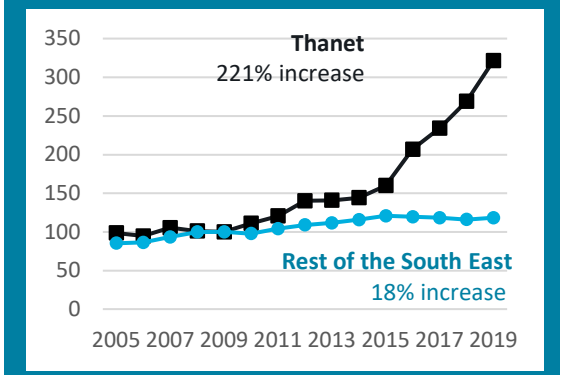
Station usage (indexed to 2009)

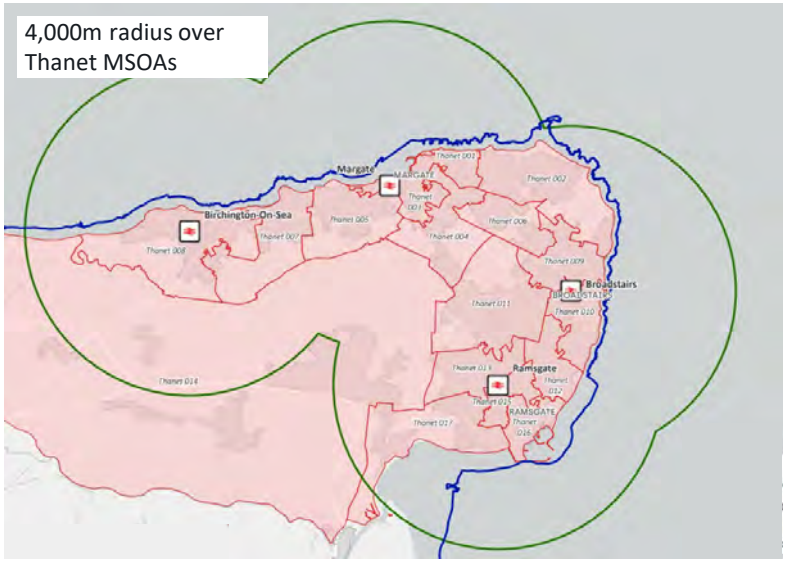


Rail journeys to London stations (indexed to 2009)

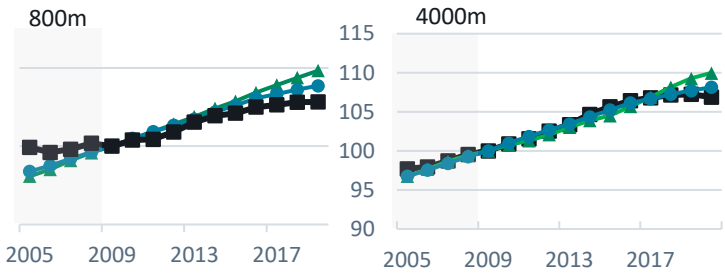


Rail journeys from London Stations (indexed to 2009)

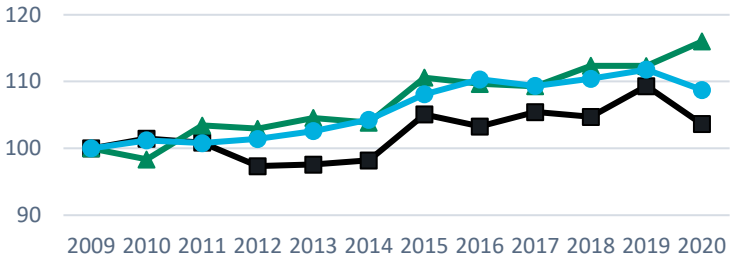




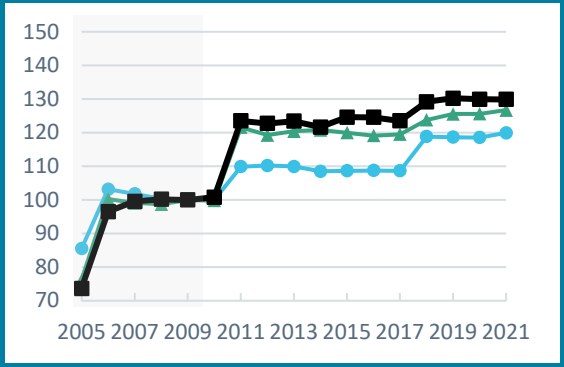
Population in station radiuses (indexed to 2009)



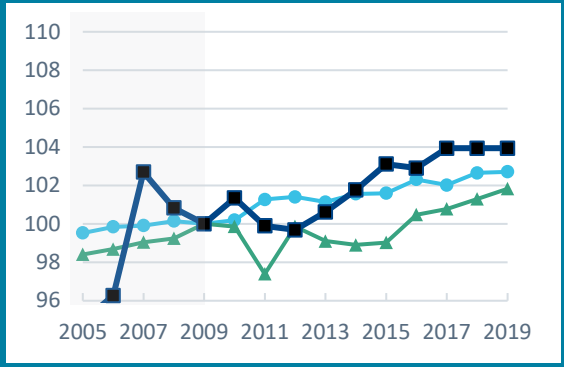
Employment in 4000m station radius (indexed to 2009)



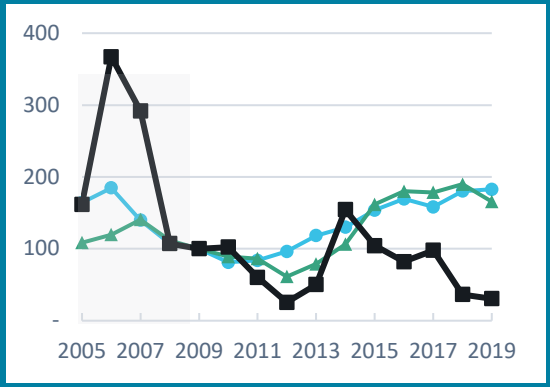
Commercial rateable value per sqm (indexed to 2009)



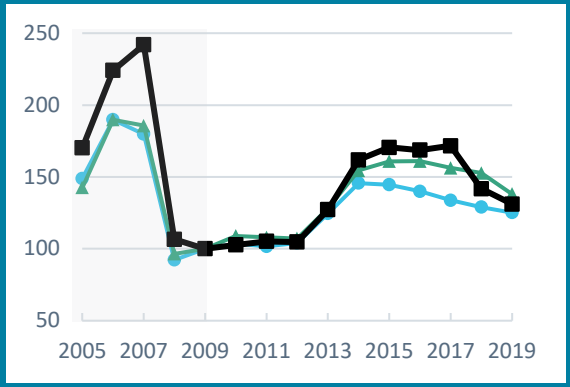
Commercial floorspace (sqm) (indexed to 2009)



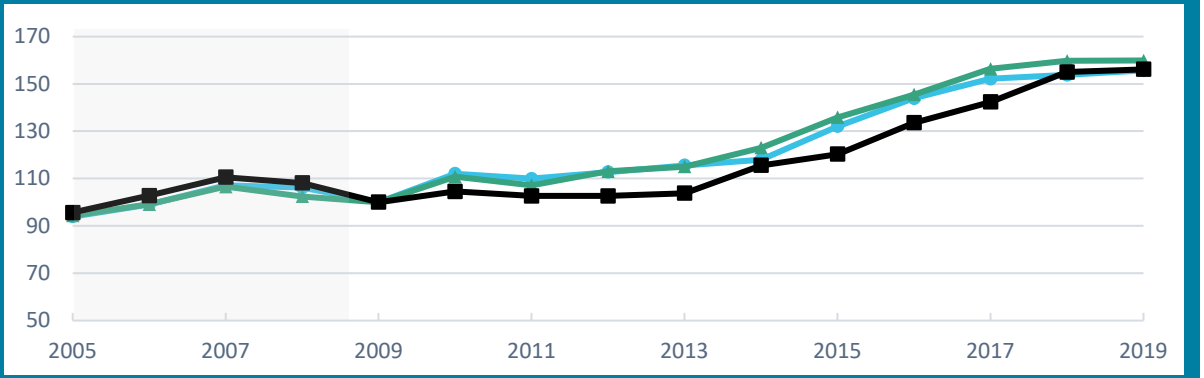
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Thanet

2 trains per hour, 94-107 minutes to London -> 2 trains per hour, 74-87 minutes to London (19% decrease)

Thanet | Rest of the South East | Rest of Kent (excluding HS1 areas)

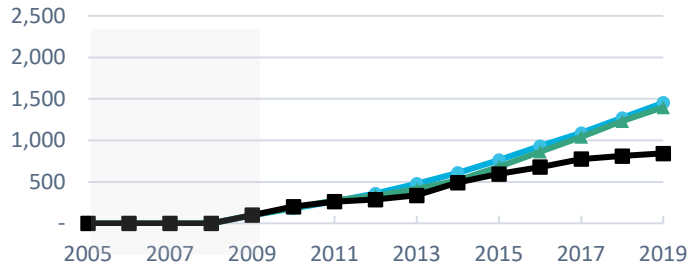
Rateable values for commercial property have been largely flat over this period, in line with the broader trend – new or revalued properties are not valued more highly than existing ones. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

Commercial floorspace has grown only slightly (3%) over the period between 2009-2019. The trend in the South East as a whole and Kent was similar, but supply in Thanet has increased slightly faster.

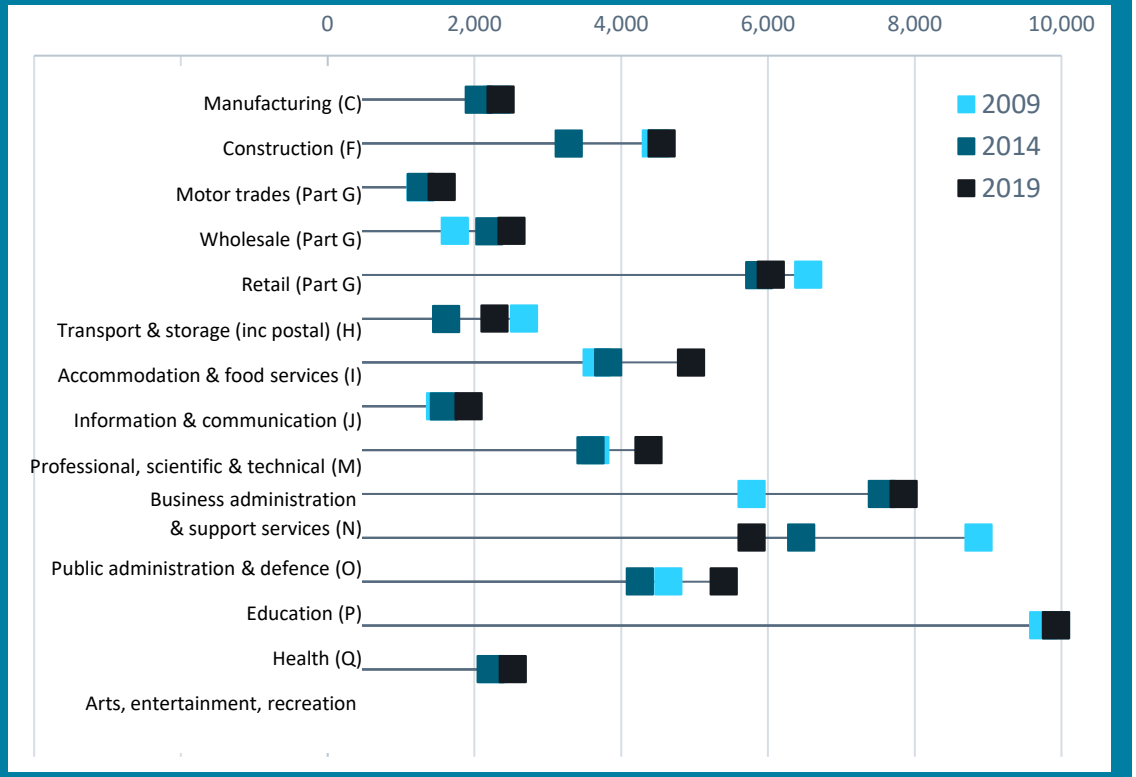
Changes to the volume of **residential property sales** in Thanet are very similar to the overall trend for Kent and the South East. New build sales are more volatile, but decreased substantially below the regional trend from 2014 onwards. New builds do not represent a substantial proportion of sales.

The trend in **prices paid for residential property** is broadly aligned with the regional trend. There is an uptick in prices in 2020 and 2021, likely reflecting the increasing popularity of the area, but this is outside the study period.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Thanet (2009 – 2019)



GVA growth per capita was flat from 2009 – 2012, and then grew at the same rate as the trend in Kent and the South East from 2012 onwards.

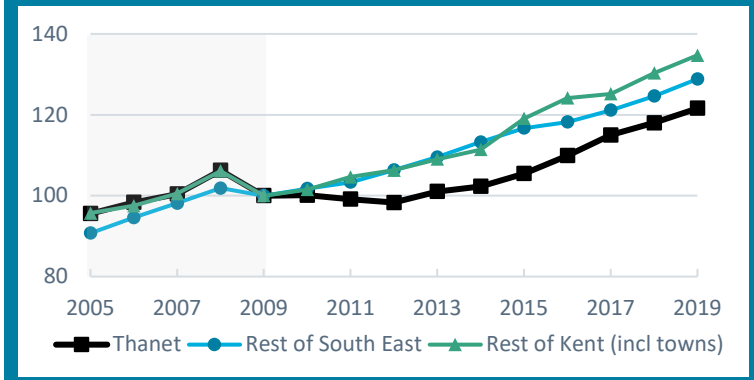
Employment in this area increased by only 4% between 2009-2019. There were increases in employment in the Accommodation and Food services (1300 additional jobs) and Business Administration (2100 additional jobs) sectors, whereas employment in Public Administration (3100 fewer jobs) decreased over this period.

Tourism to Thanet has been broadly level over the period from 2013 – 2019, although holidays have increased in volume by about 50k visits.

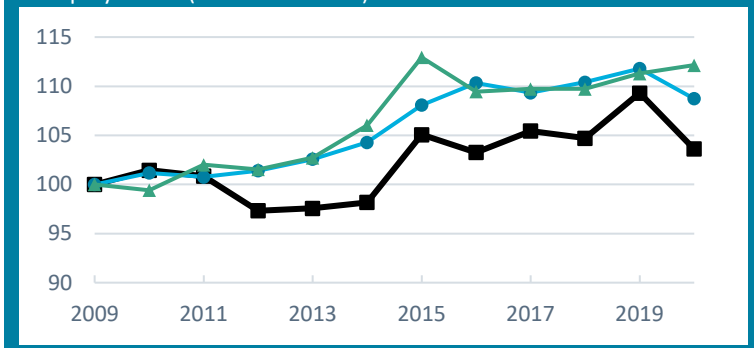
Thanet

2 trains per hour, 94-107 minutes to London -> 2 trains per hour, 74-87 minutes to London (19% decrease)

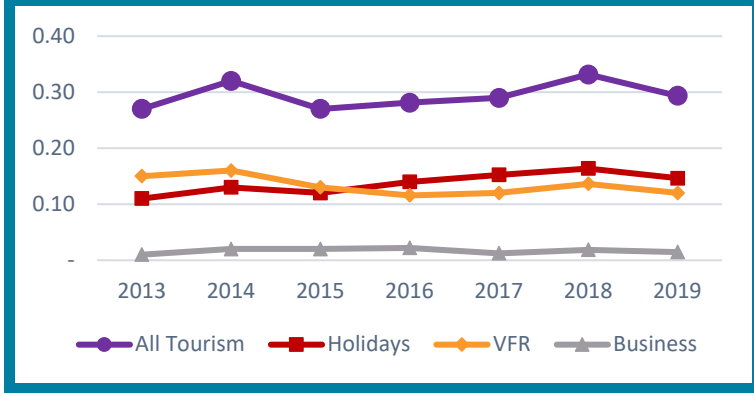
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



Whitstable and Herne Bay

All data indexed to 2009

2 trains per hour, 78-85 minutes to London -> 2 trains per hour, 72-78 minutes to London (9% decrease)

Whitstable and Herne Bay | Rest of the South East | Rest of Kent (excluding HS1 areas)

Key Messages:

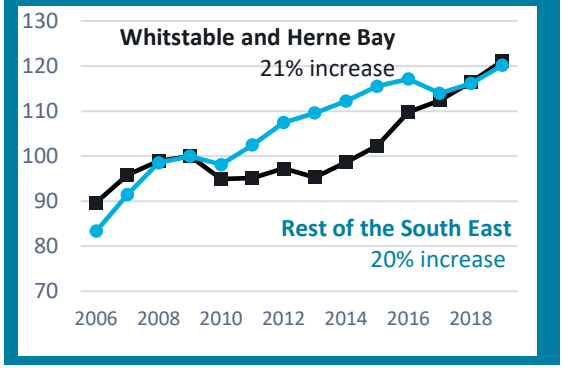
- Station usage has increased at a similar rate to the regional average.
- Whitstable and Herne Bay has seen slow growth in rail journeys to London but much higher growth in journeys from London.
- Population growth is on trend with regional averages in wider areas, but trails behind the regional averages within areas of walking distance to stations.
- Employment growth is close to the regional average.

Usage of Whitstable and Herne Bay stations has grown at a similar rate to the rest of the South East with only 1% greater growth over the regional average. Growth in travel from London was substantially higher than the regional average by 93% since 2009, reflecting the increased popularity of the region as a visitor destination. Rail journeys to London show a far lower growth rate at 9% since 2009, compared to 53% growth in the rest of the South East.

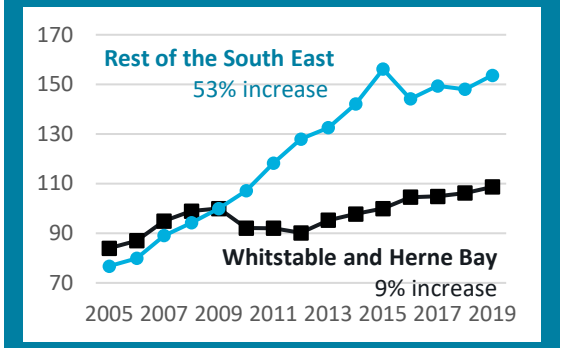
Population growth has grown at a similar rate to the regional averages at a 4,000m level but in the immediate 800m area, growth has been very gradual with only a 2% increase since 2009.

Employment growth is close to the regional average with no clear trend.

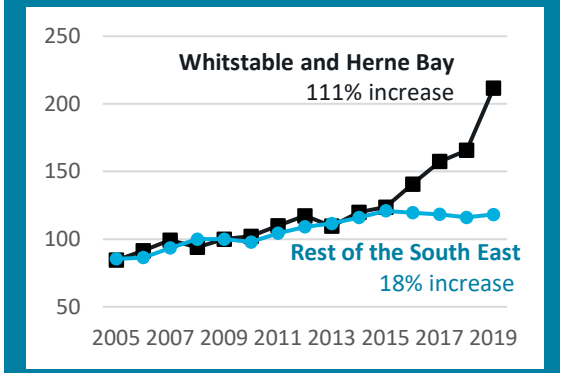
Station usage (indexed to 2009)

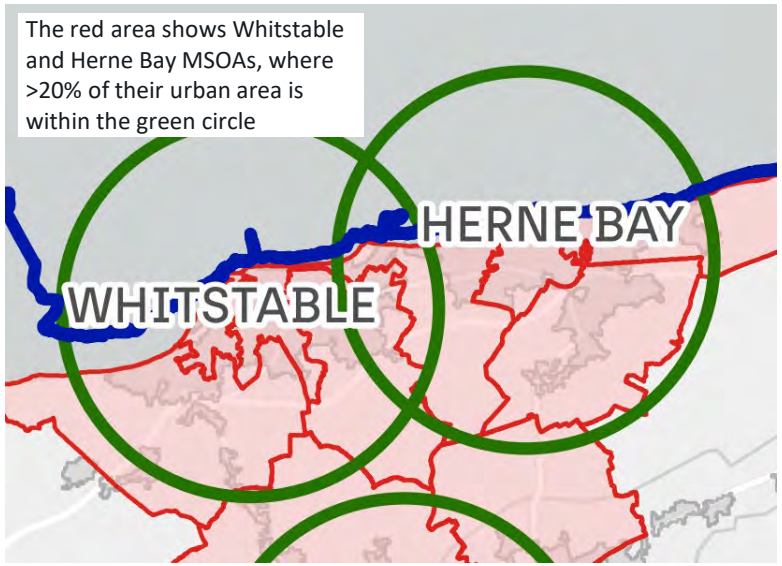


Rail journeys to London stations (indexed to 2009)

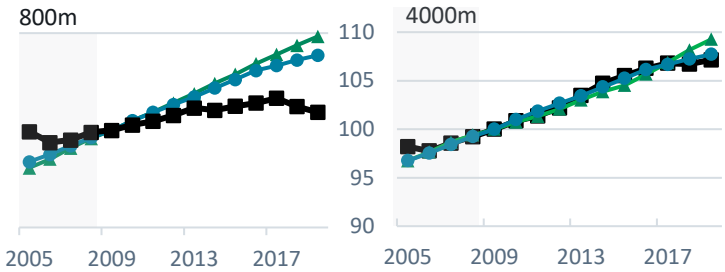


Rail journeys from London Stations (indexed to 2009)

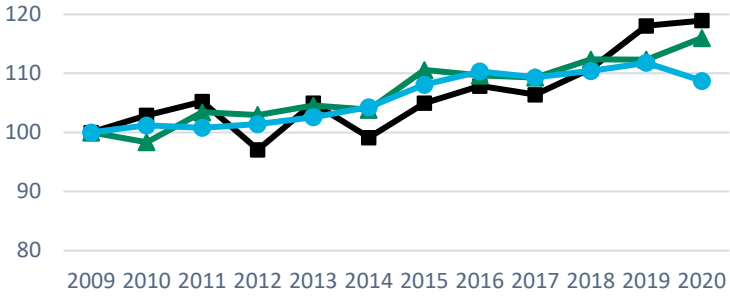




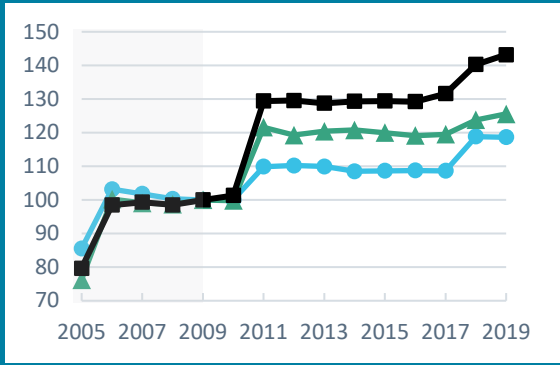
Population in station radiuses (indexed to 2009)



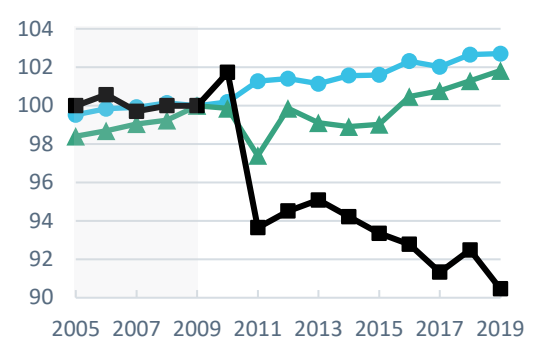
Employment in 4000m station radius (indexed to 2009)



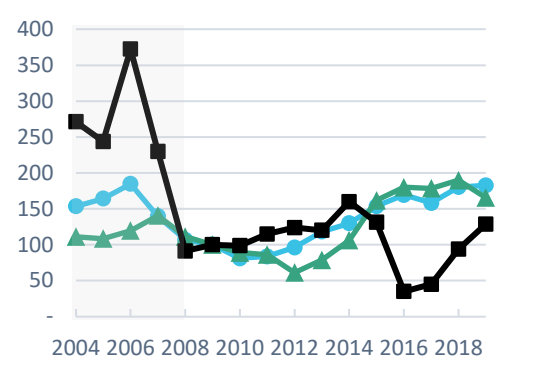
Commercial rateable value per sqm (indexed to 2009)



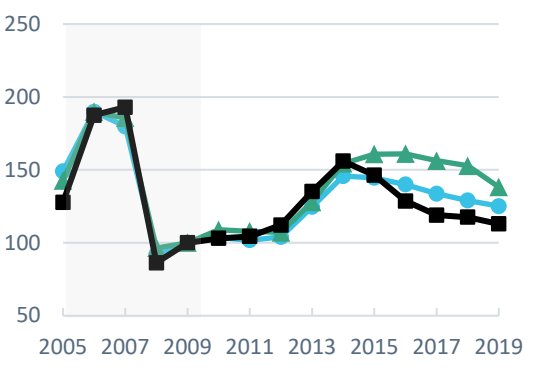
Commercial floorspace (sqm) (indexed to 2009)



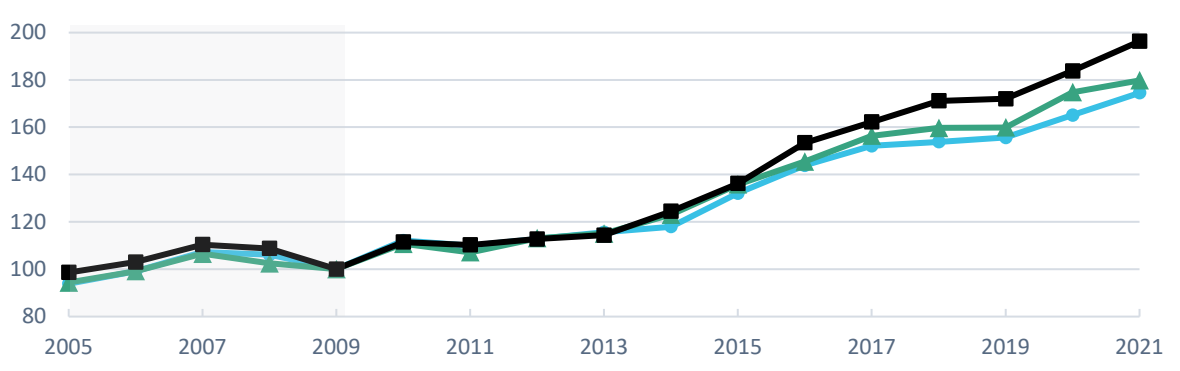
New build residential transaction volumes (indexed to 2009)



Residential transaction volumes (indexed to 2009)



Median residential sale prices (indexed to 2009)



Whitstable and Herne Bay

2 trains per hour, 78-85 minutes to London -> 2 trains per hour, 72-78 minutes to London (9% decrease)

Whitstable and Herne Bay

Rest of the South East

Rest of Kent (excluding HS1 areas)

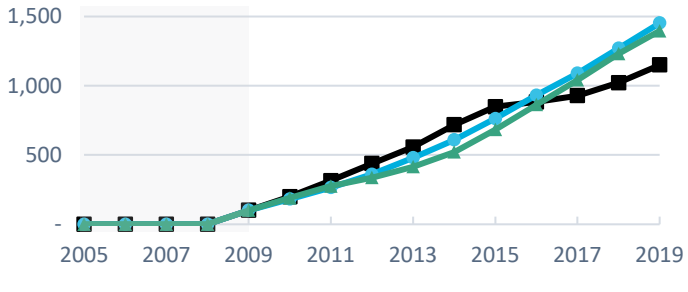
Rateable values for commercial property have grown faster in Whitstable and Herne Bay than they have in the rest of Kent and the South East. The increase in 2011 across all areas is a result of a 2010 VOA revaluation exercise.

This is likely to be linked to a sharp decline in **commercial floorspace** from 2010 onwards, with a 10% drop between 2009-2019.

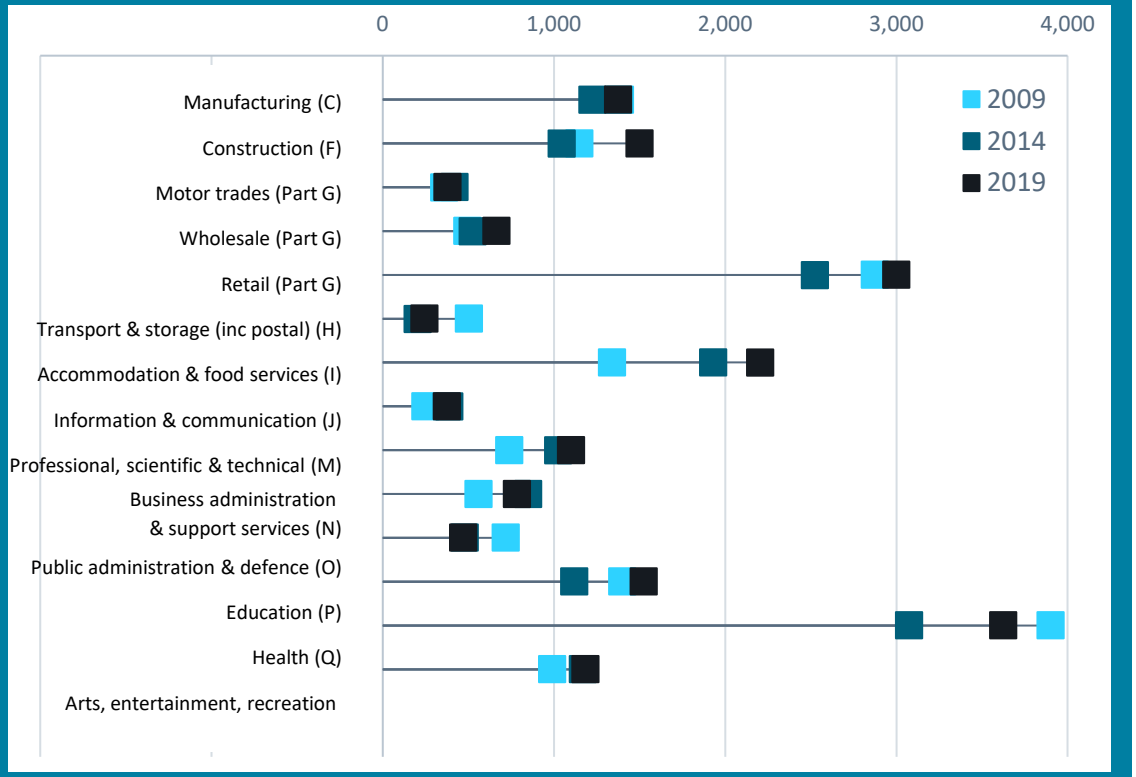
The volume of **residential property sales** in Whitstable tightly matced the regional trend until 2015, at which point they started to decrease. New build sales dropped from 2014-2016 but then grew sharply – however the overall trend from 2015 onwards is below the rest of the South East and Kent.

The trend in **prices paid for residential property** is faster growth than in the rest of the region.

Cumulative new build residential transactions (indexed to 2009)



Change in employment sectors in Whitstable and Herne Bay (2009 – 2019)



GVA growth per capita was highly aligned with the regional trend in the South East in Whitstable.

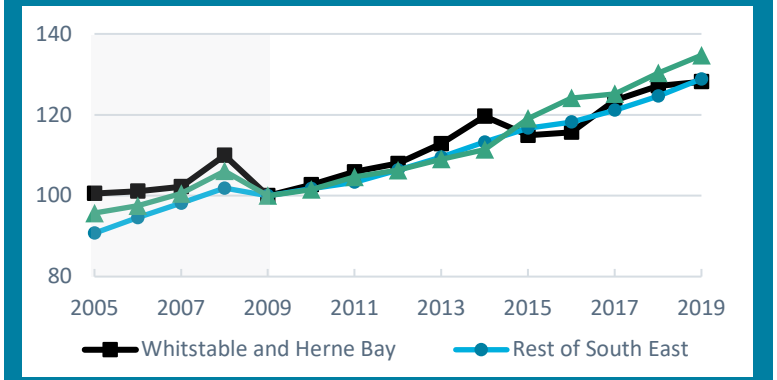
Employment in this area also followed a similar trend to the wider region, before increasing in 2018-2019. There were increases in employment in the Accommodation (over 900 additional jobs) and Retail (200 additional jobs) sectors, whereas employment in Health (300 fewer jobs) decreased over this period.

Tourism to Whitstable and Herne Bay is relatively high, but with a slight downward trend over the period data is available (2013-2019).

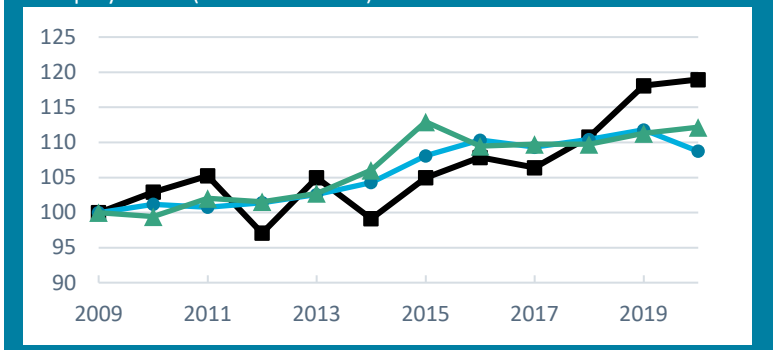
Whitstable and Herne Bay

2 trains per hour, 78-85 minutes to London -> 2 trains per hour, 72-78 minutes to London (9% decrease)

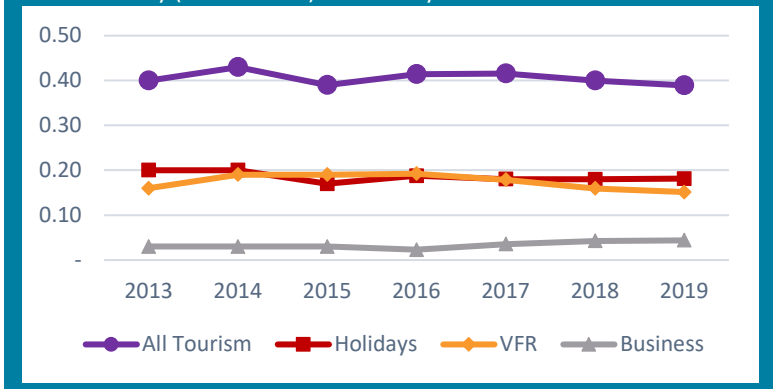
GVA per capita – (indexed to 2009)



Employment - (indexed to 2009)



Visitor activity (million visits) – data only available from 2013



D Econometric analysis - technical report

Technical report

D.1 The quantitative impact of HS1 is estimated at two different phases. The first phase is at the local authority district level, using publicly available data and Cambridge Econometrics internal data. The second phase is at the station level, using secured data on individual firms from the Inter Departmental Business Register. Different estimation methods are used at the different levels.

D.2 The area-level analysis points towards an increase in house prices and population around stations served by HS1, while the impact on output is uncertain. When zooming in at the firm-level, it becomes clear that employment and turnover per local unit decrease vis-à-vis non-HS1 stations. The data on productivity[38] is less clear, with results often inconclusive.

D.3 Overall, the findings above point to an increase in commuting to central London. This would be consistent with higher prices and population, but slight decrease in workplace employment (relative to comparators).

Phase 1

D.4 The first phase looks at the local authority districts served by HS1, and assesses their performance before and after HS1 becomes operational.

Local Authority-level Synthetic Control

D.5 The first hypothesis we test is that HS1 had a positive impact for the wider surrounding area, making it more attractive to live in and encouraging economic development. We define the wider surrounding area as a local authority district (LAD) with an HS1 station. The outcomes we check for are population, house prices and GDP.

D.6 The Synthetic Control analysis showed some results at the local authority level in terms of house prices and population. Results in terms of output are negative in some LADs and inconclusive in terms of productivity.

D.7 More details on the method and detailed results follow below.

[38] Measured as turnover per employment, at the enterprise level.

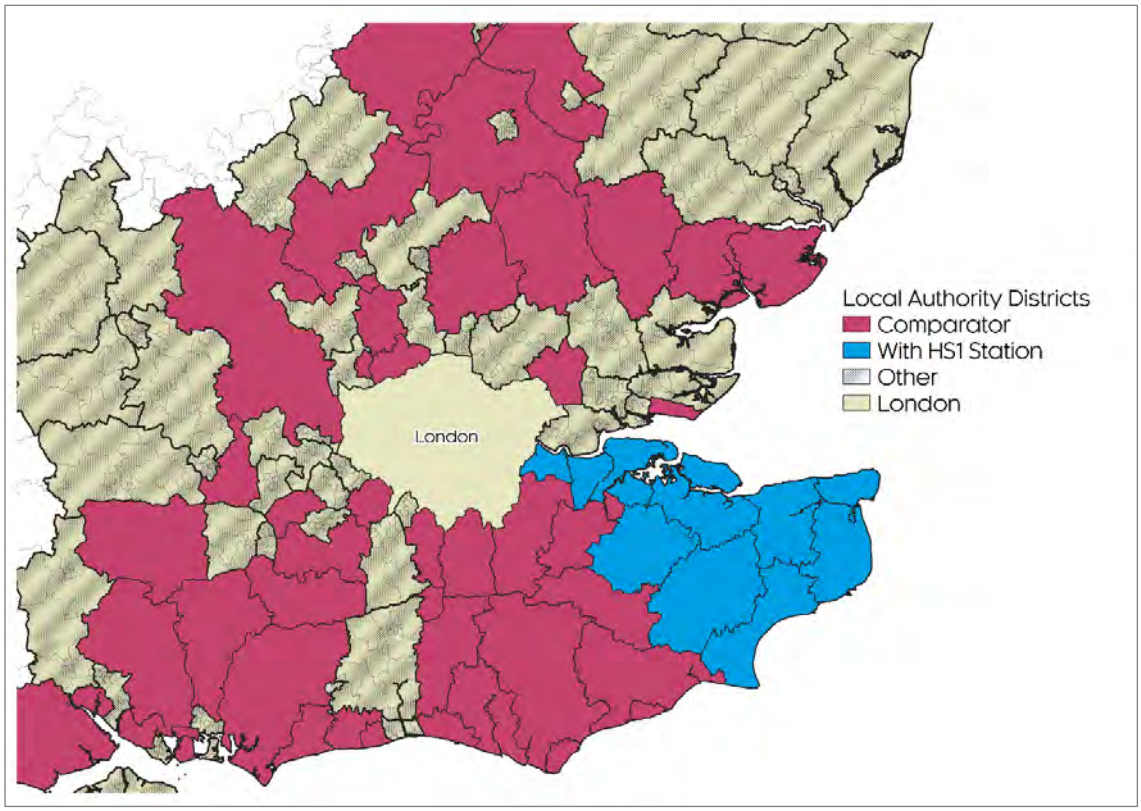
I. Method

D.8 At the local authority level we use Synthetic Control Method to create a comparator area for each local authority district with an HS1 station. At the station level, we use Propensity Score Matching to find the best comparison for each station with an HS1 connection.

- pre-intervention period: 2000 – 2008
- post-intervention period: 2009 – 2019

D.9 We used synthetic control matching to compare local authorities with similar characteristics. Figure D.1 below shows a map of all the **treated areas (blue)** and the **possible comparators (red)**.

Figure D.1: Local Authority Districts, by treatment status



Note(s): Only a selection of comparable stations are used.
Source: ONS 'Local Authority Districts (December 2021) UK BFE', University of Edinburgh 'GB Railways and stations'; Cambridge Econometrics analysis

D.10 Each treated area is matched to a group of weighted comparators areas. The weights of the comparators are selected so as to minimise the difference between the treated and synthetic control area, based on a set of confounding variables.[39]

[39] These are chosen as GDP, population, house prices, job density, rurality (%), GJT to central London.

Job density defined as: employment (workplace-based) / working age population

Productivity defined as: GVA / employment (workplace-based)

D.11 As a proxy for the local authority-level distance to London, we average the minutes it takes to central London across its stations with available data, in 2008.

II. Results

D.12 An overview of the models explored and their results are shown in Table D.1 below. It is important to note that Synthetic Control Method does not have confidence intervals in the way it is calculated. Therefore, the estimation results are evaluated based on visualisation and a qualitative assessment of the regions used as comparators.

Table D.1: Models explored at the area-level, and synthetic control results

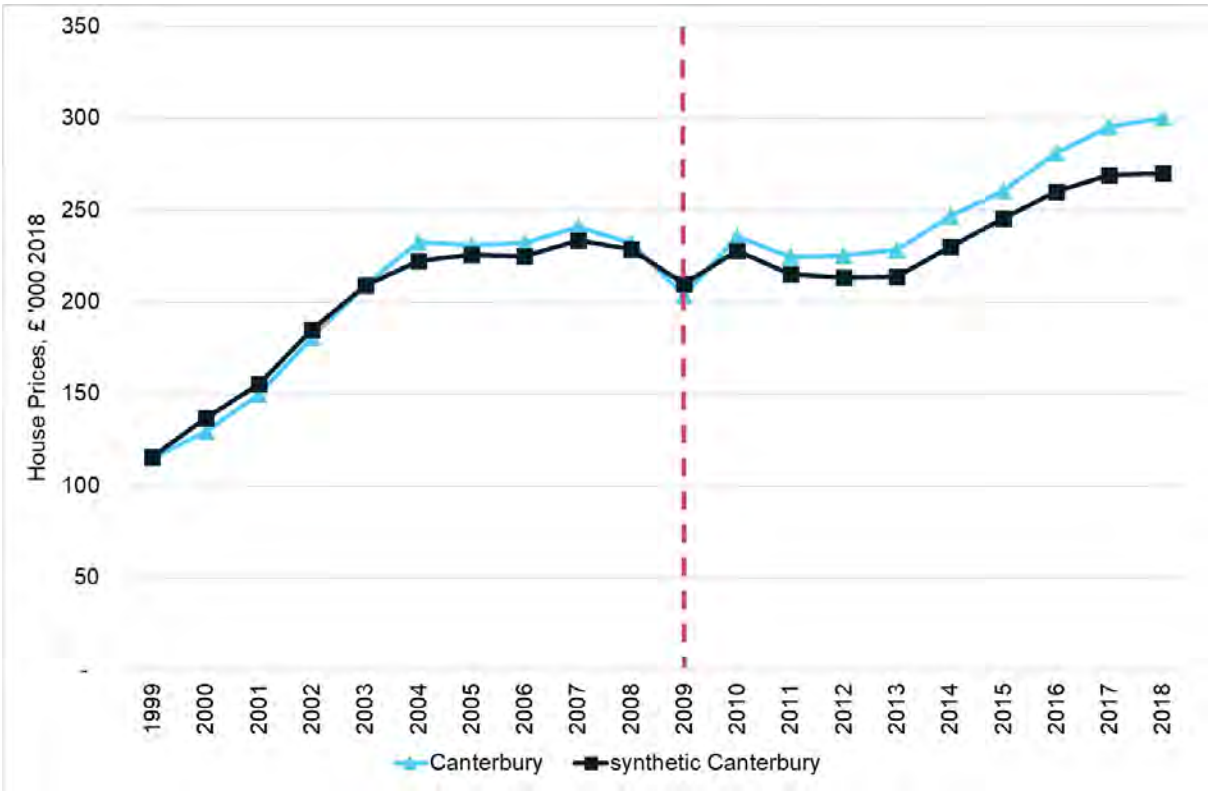
Outcome	Matching variables	Impact detected	Overall impact
House Prices	house prices population change job density GVA per capita rurality (%) GJT to central London	Positive in Canterbury, Dartford, Gravesham, and Medway; inconclusive in the rest.	Positive, with increasing certainty over time
GDP	GDP Employment job density productivity GJT to central London	Negative in Canterbury, Medway, Swale, Maidstone; inconclusive in most; not a good match for Dover.	Negative, uncertain
Population	Population population change job density rurality (%) GJT to central London	Positive in most, negative in Medway.	Positive, with increasing certainty over time
GVA in Construction	GVA in Construction Employment Productivity Job density Rurality (%) GJT to central London	Neutral across all sectors	

Notes: Overall impact is calculated using a multiple treated area synthetic control method. Increasing certainty over time means a decreasing p-value. Uncertain means a relatively stable and high p-value.
Productivity measured as Gross Value Added over employment
Job density measured as workplace-based employment over working age population
Overall impact uses all regions as treated.
Source: Cambridge Econometrics LEFM, ONS, Steer; Cambridge Econometrics analysis

D.13 Better connectivity to London and international destinations is likely to make a place more attractive to live and do business in. Higher demand for housing is likely to drive prices up. An increase in the median house price can be detected in four local authorities with an HS1 station: Canterbury, Dartford and Gravesham, and Medway to a smaller extent. No negative impact is detected in any of the areas examined.

D.14 In Canterbury, the difference in the median price paid for a house started to diverge from comparator areas in 2009 (see Figure D.2 below).

Figure D.2: Median price paid for a house in Canterbury, compared to synthetic control, 1999-2018

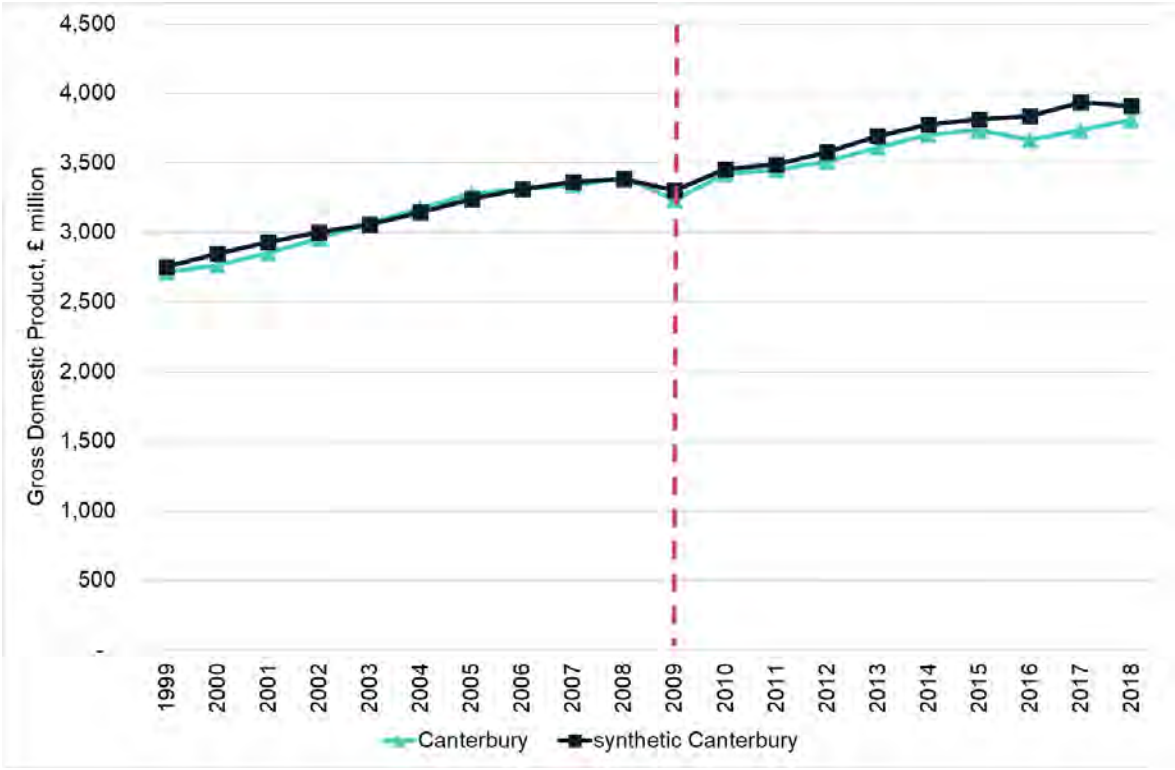


Notes: Synthetic Canterbury includes Eastbourne and Hastings amongst others
Source: Cambridge Econometrics LEFM, ONS 'House Price Statistics for Small Areas', Steer; Cambridge Econometrics analysis

D.15 In 2018, the median price paid in Canterbury was more than ten percent higher than in control areas. In Dartford, Gravesham and Medway, prices begin diverging after 2011, reaching a 5 to 9% difference in 2018. This is likely to be a result of disruption caused to the economy and housing market in the wake of the 2008 Financial Crisis taking longer to dissipate and recover. A smaller impact on median house prices is detected at the other local authorities examined.

D.16 Better connections to the Capital may boost output for firms established in the area. Meeting clients is made easier and more comfortable, boosting networking opportunities. On the other hand, commuting to London becomes more attractive for the local population, therefore increasing output in London over the treated area. This is consistent with the decrease in GDP we see in the treated areas after 2008, relative to the synthetic control. For example, Canterbury dips slightly below its synthetic control by 2018, as shown in Figure D.3 below.

Figure D.3: Gross Domestic Product in Canterbury, compared to synthetic control, 1999-2018

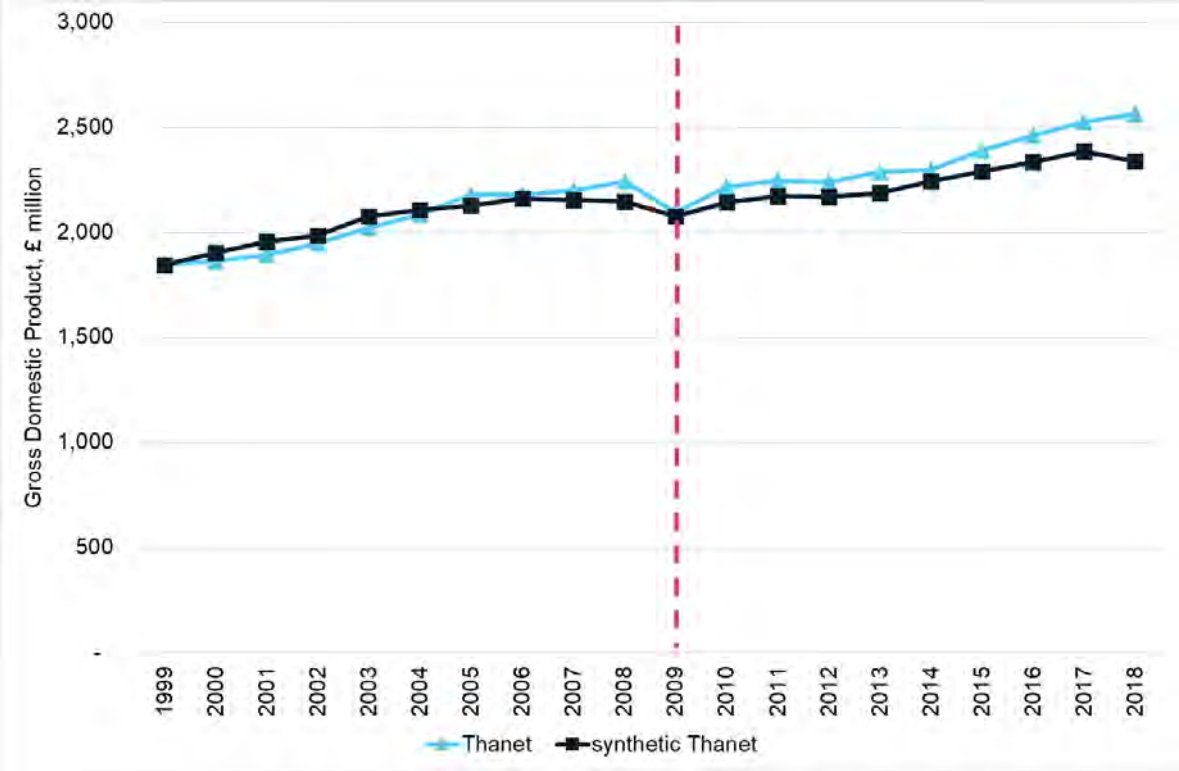


Notes: Synthetic Canterbury includes Eastbourne, Colchester, Portsmouth and East Cambridgeshire
Source: Cambridge Econometrics LEFM, ONS 'Regional Gross Domestic Product for Local Authorities', Steer; Cambridge Econometrics analysis

D.17 Overall, GDP in Canterbury has remained fairly constant, falling to 3% lower than the synthetic control. The main driver seems to be a negative shock in 2016, so the effect may not be linked to HS1.

D.18 Negative GDP changes can be detected in most local authorities with an HS1 station. In particular, Medway, Swale, Maidstone and Dover experience the largest negative impact. On the other hand, a positive impact is detected in Thanet (Figure D.4 below) and Gravesham (not shown). Some areas with a historically low employment-rate (such as Swale and Thanet) have persistent low level of skills and knowledge concentration. This means that an intervention such as transport links is unlikely to turn these trends around.

Figure D.4: Gross Domestic Product in Thanet, compared to synthetic control, 1999-2018



Notes: Synthetic Thanet includes Tendring, Hastings and Southend-on-Sea
Source: Cambridge Econometrics LEFM, ONS 'Regional Gross Domestic Product for Local Authorities', Steer; Cambridge Econometrics analysis

D.19 Population has increased in all local authorities after the start of HS1 services, except for Medway.

D.20 Inconclusive or negative results have been shown for job density and employment. This could be because construction work on the station and lines, all within the same local authority, would have provided a temporary employment boost well before the intervention date. Therefore, when the works ended and the line became operational in 2009, workplace-based employment and job density decreased.

D.21 Results are not conclusive at the local authority level, but they point to an increase in population, leading to increased house prices. However, that population often commutes to work. This means that employment does not increase, and nor does the corresponding output. In the short term, there seem to be negative shocks in output, from increased commuting.

Phase 2

D.22 The second phase looks at the area around HS1 stations. It assesses performance of individual firms, as well as the area as a whole.

Station-level Synthetic Control

D.23 The second hypothesis we test is that HS1 had a positive impact for the immediate surrounding area, making it more attractive for businesses to set up there. We define the immediate surrounding area as a 1.5 km wide ring around each HS1 station. The outcomes we

check for in each ring are turnover, employment productivity, the number of businesses and the number of young enterprises.[40]

D.24 The Synthetic Control analysis showed positive results around some of the stations, but remained inconclusive in most. In particular, Rochester experienced a positive impact in terms of total turnover and employment, as well as the number of businesses, both young and overall. In Gillingham, there was an increase in the number of businesses and total employment. More details on the method and detailed results follow below.

I. Method

D.25 At the station level we use Synthetic Control Method to create a comparator area for each HS1 station. This means that we try to compare areas that are similar before the intervention, reducing selection bias.

- pre-intervention period: 2003 – 2008
- post-intervention period: 2009 – 2019

D.26 We used synthetic control matching to compare local authorities with similar characteristics. It is the most appropriate method for this setting because of the relatively small sample size (23 treated and 83 control areas). Other methods for matching treated units to appropriate controls require larger samples to be effective.[41] Additionally, Synthetic Control Method shows which specific areas the 'synthetic control area' is made up from. This degree of transparency allows us to examine any idiosyncrasies of treated and control areas that cannot be captured by the estimation.

D.27 We used the synthetic control method to generate comparable stations to those served by HS1. Then we compared a series of outcomes in the two catchment areas. This process is repeated for each year. The hypothesis is that as time passes from the intervention period, areas around HS1 stations will grow faster. This growth will be measured by the number of businesses, productivity, turnover and employment. Figure D.5 below shows a map of all the treated stations (blue) and the possible controls (red).

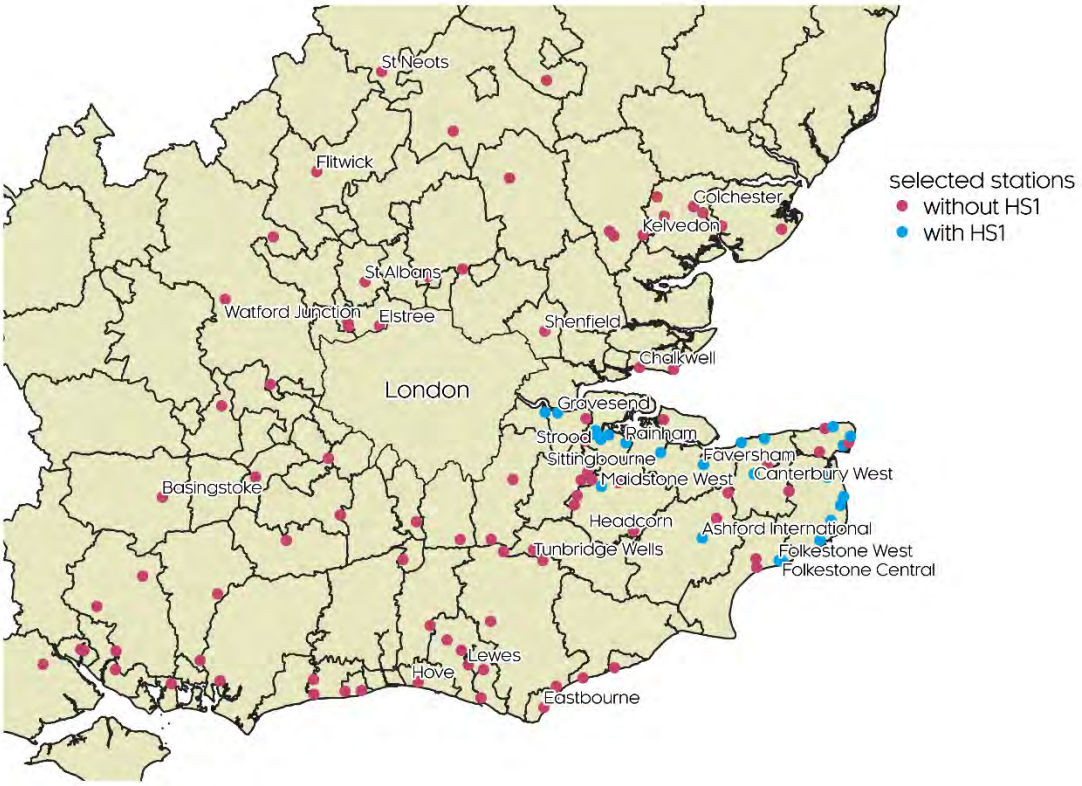
[40] productivity defined as turnover divided by employment

young enterprises defined as those established in the past five years

[41] For example, Propensity Score Matching requires a sample of at least 200 to be effective.

Howarter, S. (2015) "The Efficacy of Propensity Score Matching in Bias Reduction with Limited Sample Sizes". Available at: **Howarter_ku_0099D_14389_DATA_1.pdf**

Figure D.5: Rail stations by treatment status



Note(s): Only a selection of comparable stations are used. The 20 busiest stations are named.
Source: ONS 'Local Authority Districts (December 2021) UK BFE', University of Edinburgh 'GB Railways and stations'; Cambridge Econometrics analysis

D.28 The group of potential comparator stations (those without an HS1 connection) are chosen from all directions outwards from London. Stations around other major cities are not considered because of London's unique economic characteristics.

II. Results

D.29 This model uses the synthetic control method[42] to estimate the impact of HS1 on a series of outcomes. It is important to note that when evaluating the impact on knowledge-intensive businesses we only used a shorted pre-intervention period from 2007 to 2008, because of a sectoral classification change. Some of the results are summarised in Table D.2 below.

[42] (Abadie and Gardeazabal, 2003, Abadie et al., 2010)

Table D.2: Models explored at the station-level, and synthetic control results, 2019

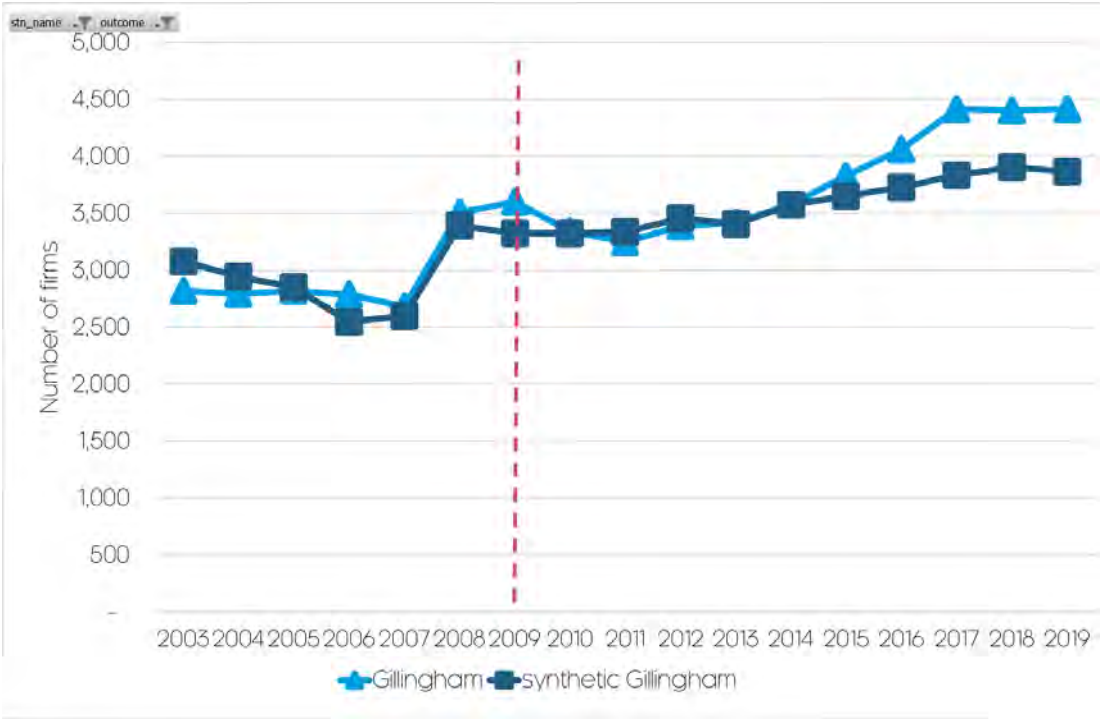
Outcome	Matching variables	Impact detected
Number of firms	Number of firms Proportion of KIBs Area turnover Area productivity GJT to central London (2008)	Positive in Ebbsfleet, Gillingham, Gravesend, Rochester, Strood; Negative in Ashford, Dover Priory and Faversham; neutral in the rest.
Turnover in the area	Area turnover Proportion of KIBs Area productivity GJT to central London (2008)	Positive in Chatham, Gillingham, Rochester, Walmer; neutral in the rest.
Employment in the area	Area employment Area turnover Proportion of KIBs Area productivity GJT to central London (2008)	Positive in Folkestone West, Gillingham, Rochester; Negative in Ashford, Ebbsfleet; neutral in the rest
Area productivity	Area productivity Number of firms Area turnover Proportion of KIBs GJT to central London (2008)	Positive in Ebbsfleet, Martins Mill, Ramsgate; Negative in Folkestone Central, Gravesend; neutral in the rest.
Young firms[43]	Young firms Area productivity Number of firms Proportion of KIBs GJT to central London (2008)	Positive in Chatham, Ebbsfleet, Gillingham, Gravesend, Rochester, Maidstone, Strood, Folkestone Central; Negative in Ashford, Canterbury, Martin Mill, Herne Bay and Faversham; neutral in the rest.

Notes: Firms are defined as local units (i.e. branches) and not enterprises.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

D.30 Some of the areas experiencing the strongest positive change are Gillingham, Ebbsfleet, Rochester, Folkestone and Strood. For example, the number of firms in Gillingham increased significantly relative to its comparators after 2013 (see Figure D.6 below).

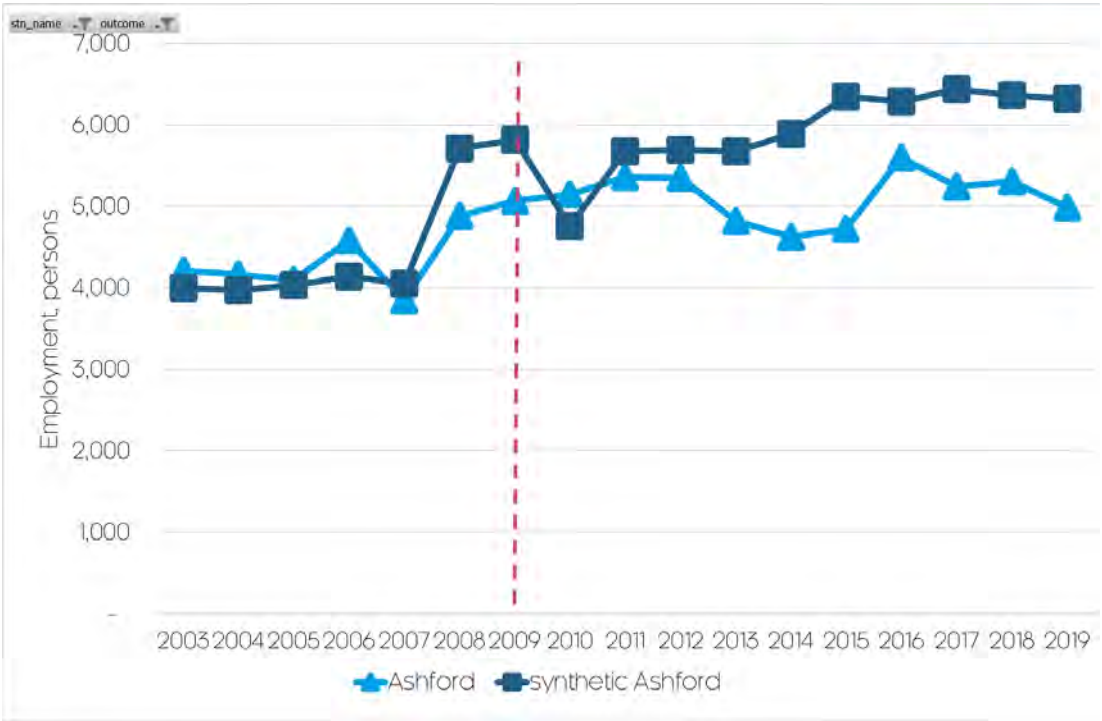
[43] Businesses less than 5 years old

Figure D.6: Number of firms near Gillingham Station, compared to synthetic control, 2003-2019



Notes: Synthetic Gillingham includes Tunbridge Wells and other stations
Source: Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

Figure D.7: Employment near Ashford International Station, compared to synthetic control, 2003-2019

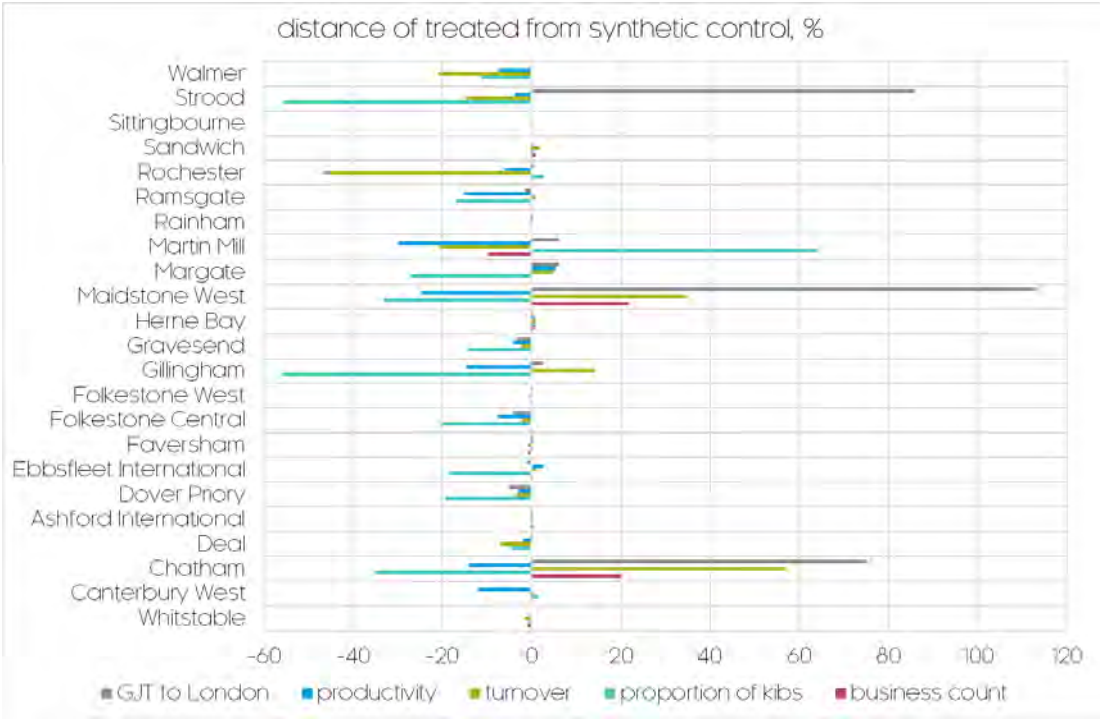


Notes: Synthetic Ashford includes Ifield, Cosham, Salfords, and Shenfield Stations, among others
Source: Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

D.31 The matching quality depends on how close each treated station's matching variables are to the weighted comparator's matching variables over the pre-intervention period (2003-2008). The weights are determined so as to minimise that distance by construction. Therefore the extent to which they manage to do so determines the quality of the match.

D.32 Figure D.8 below shows the distance of the treated area from the synthetic control, across all matching variables for the model on the number of businesses (business count). For example, a rating of -30% for productivity (see Martin Mill) means the average productivity before the intervention was 30% lower around the treated area when compared to the control area.

Figure D.8 Business Count model: distance of treated areas from their control across the matching variables



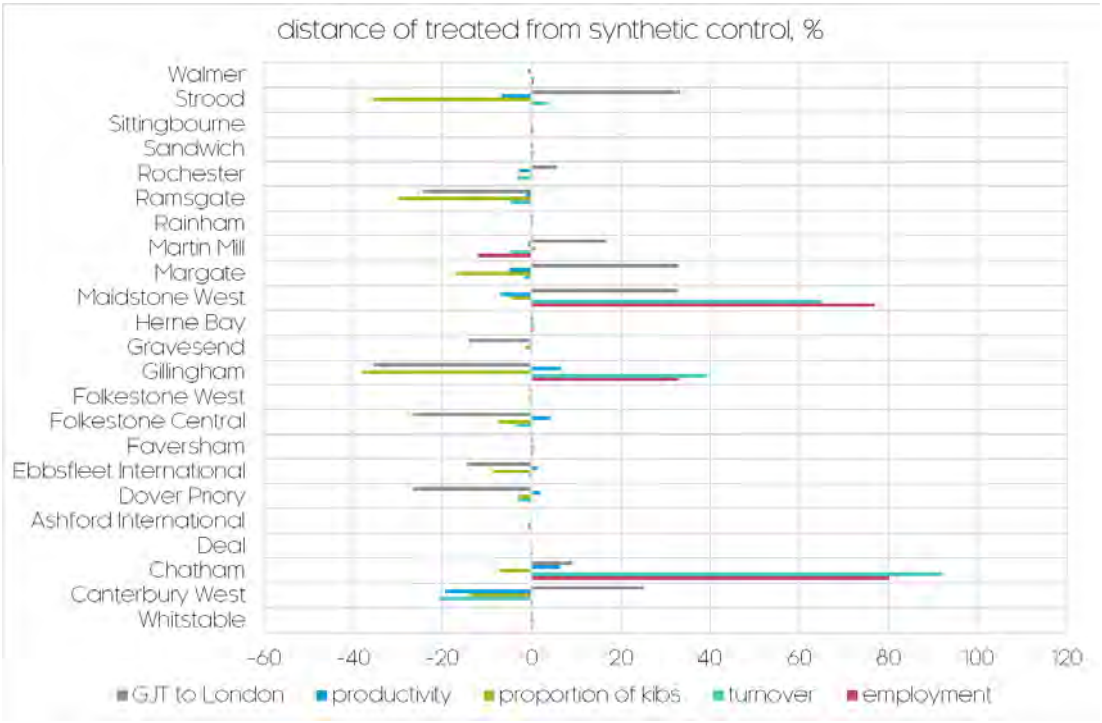
Note(s): Distance of a variable is calculated as: 100*[(treated pre-intervention average/control pre-intervention average) -1]
Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

D.33 Figures D.9 to D.12 below show the same measure for the employment, productivity, turnover and young businesses models respectively. The distance varies between stations but is generally considered good if within a range of + or – 20%. Most of the stations have lower productivity than their comparators, which is a likely consequence of the low wage characteristics identified and discussed in Chapter 5. Nevertheless, the difference in productivity only exceeds 20% in Maidstone West and Martin Mill. Results for these stations should be interpreted with that in mind.

D.34 Maidstone West, Chatham and Strood stand out as having large differences with their comparators. Maidstone West is usually much further from central London than its controls, and has a lower productivity and proportion of KIBs. Chatham is also further from London than its controls, and has a larger business turnover. It also has a lower proportion of KIBs. Strood is also further from London than its controls and has a lower proportion of KIBs, across all five models. This suggests that results for these three stations should be interpreted with caution across all five models. Additionally, Gillingham tends to have a lower proportion of KIBs than

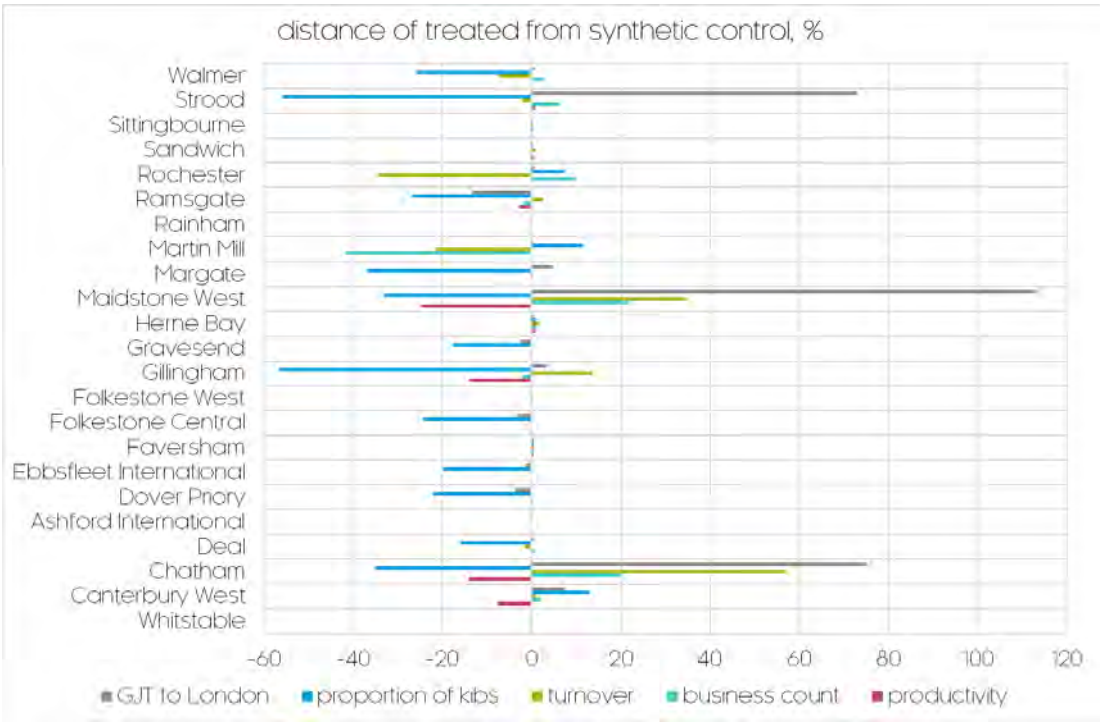
its controls, but is well matched across other variables. An exception is the employment model, where Gillingham is not well matched (see Figure D.9 below).

Figure D.9 Employment model: distance of treated areas from their control across the matching variables



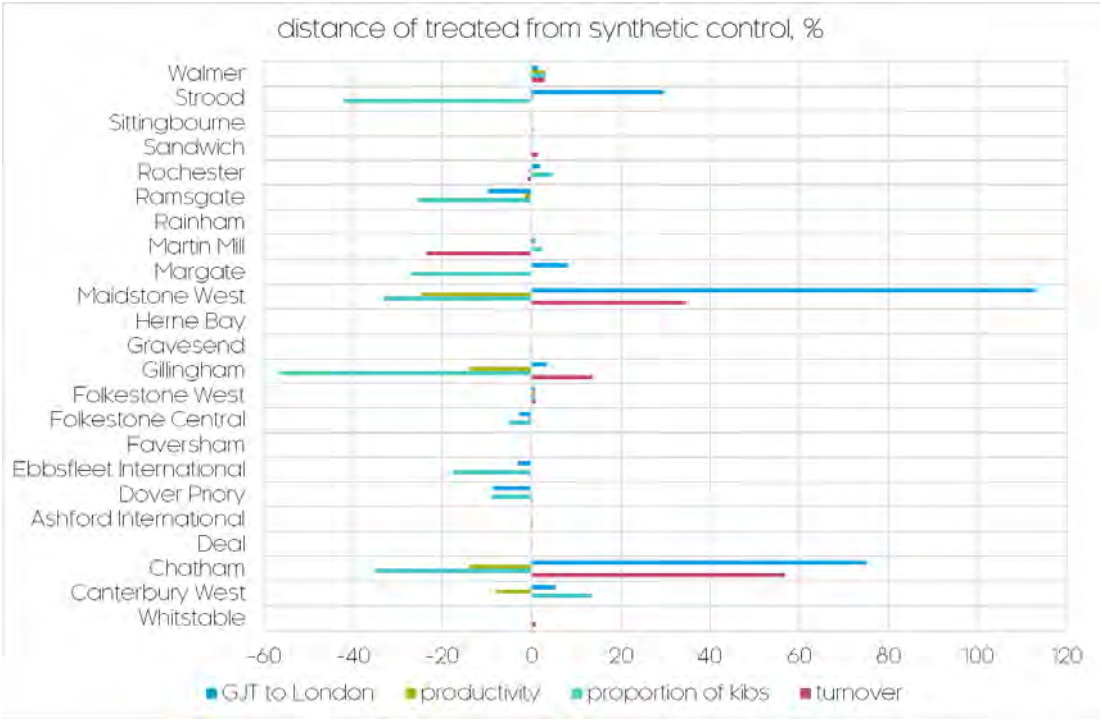
Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

Figure D.10 Productivity model: distance of treated areas from their control across the matching variables



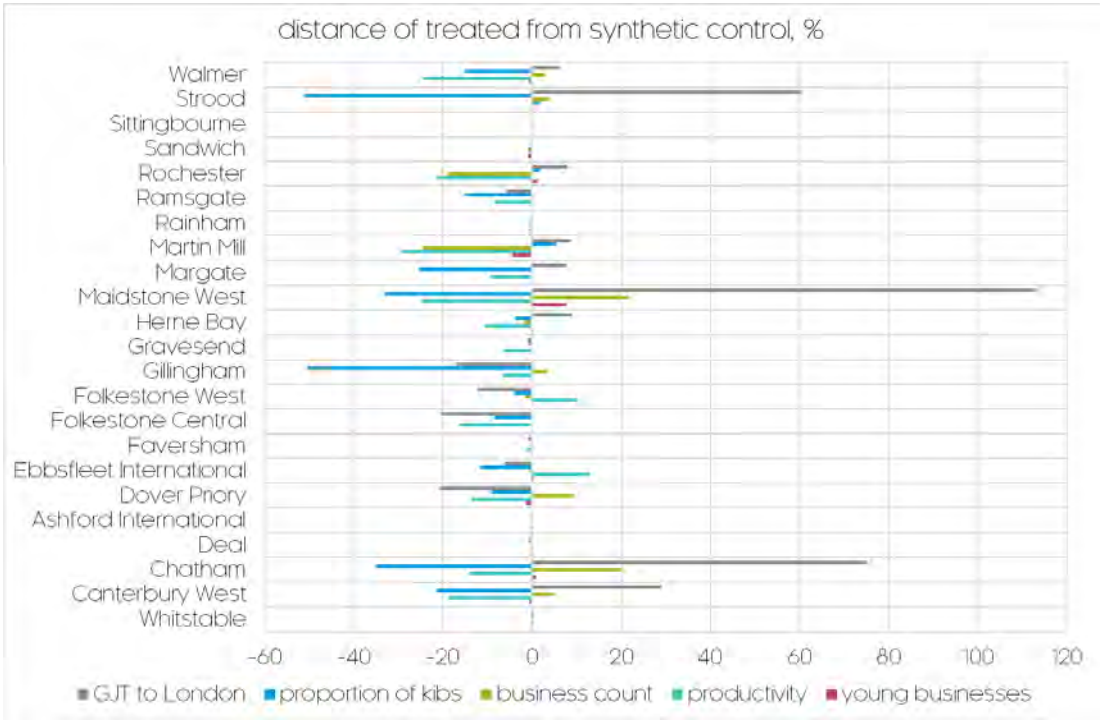
Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

Figure D.11 Turnover model: distance of treated areas from their control across the matching variables



Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

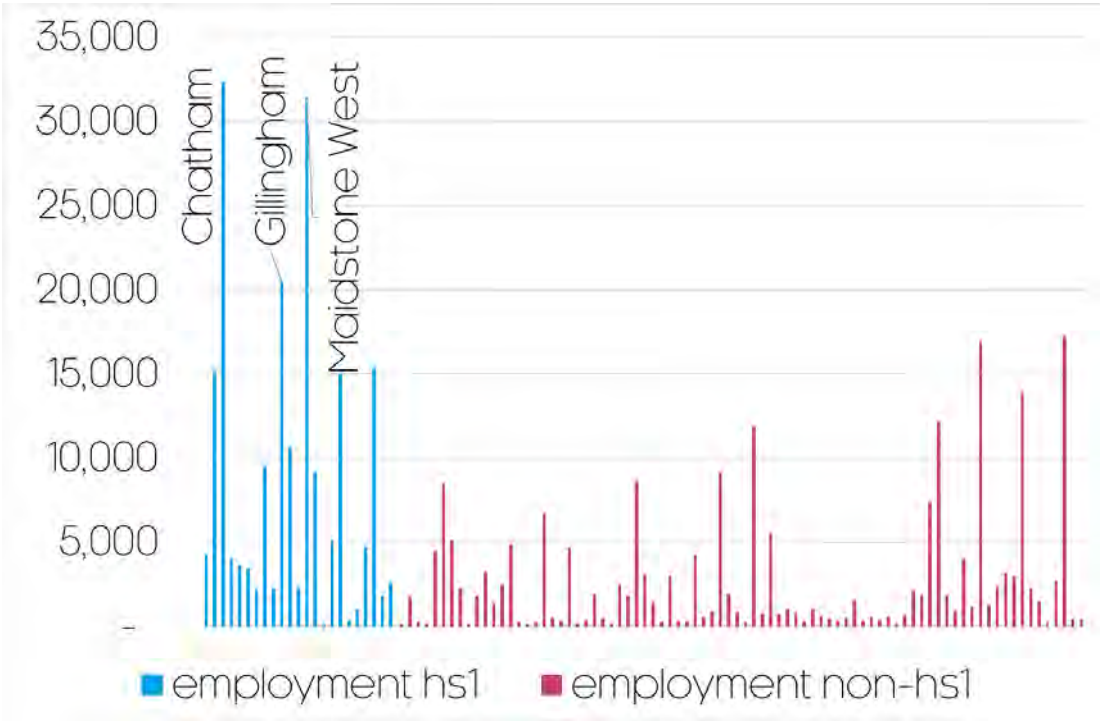
Figure D.12 Young businesses model: distance of treated areas from their control across the matching variables



Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

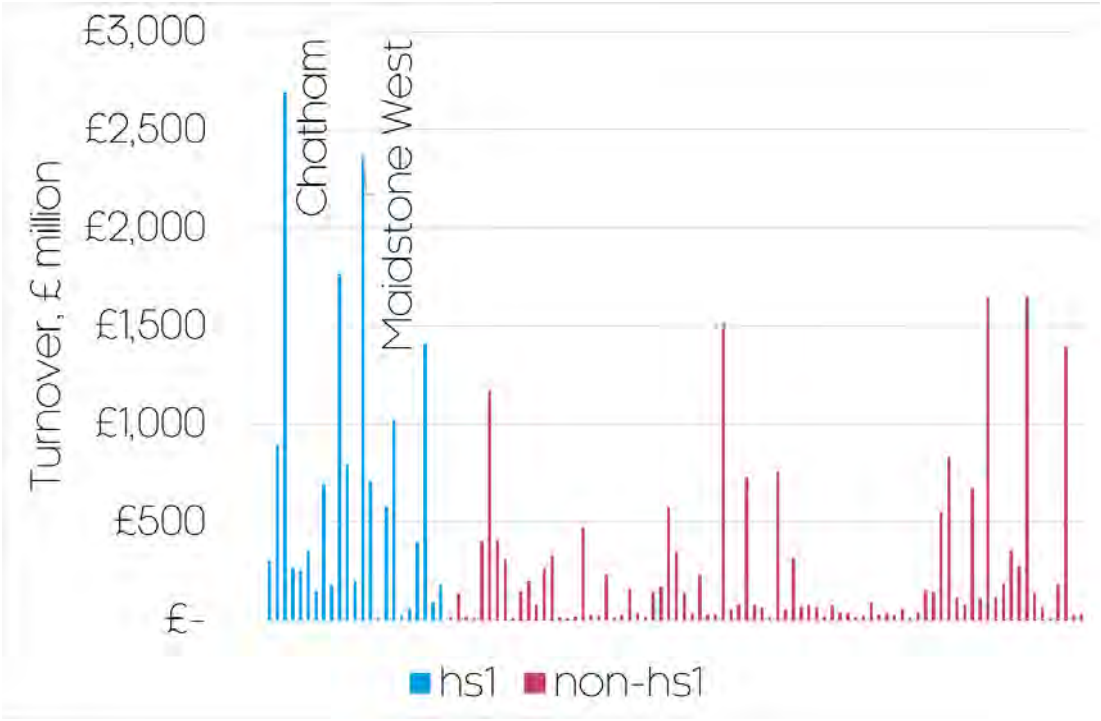
D.35 Overall, treated and comparator stations have comparable values across the variables examined (turnover, employment, business count, proportion of KIBs, area productivity). For example, Figure D.13 and Figure D.14 below look at employment and turnover in **treated stations (blue)** and the **possible controls (red)**. There are two clear outliers, Chatham and Maidstone West, and to a lesser extent Gillingham. The main reason that these three areas cannot be matched effectively is their higher level of pre-intervention business activity. In particular, their high level of employment and turnover within 1.5 km from the station cannot be matched by any of the potential control stations.

Figure D.13 Total local unit employment, 1.5 km ring from station



Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

Figure D.14 Total local unit turnover, 1.5 km ring from station



Source(s): Inter-Departmental Business Register, 2003 - 19; Cambridge Econometrics analysis

D.36 That does not make the results invalid, but it means that they should be interpreted with caution, given the fact that Chatham, Maidstone West and to a smaller extent Gillingham start with higher levels of turnover and employment than any potential synthetic control. This can impact the matching across other matching variables (productivity, number of businesses, GJT to central London, the proportion of KIBs and number of young businesses).

D.37 To summarise, besides three exceptions for (Chatham, Maidstone West, and to a lesser extent Gillingham), the data above show that the treated areas and the control areas are comparable.

Firm-level Propensity Score Matching

D.38 Finally, we test whether HS1 had a positive impact for firms in the immediate area around the station. We define the immediate surrounding area as two rings around an HS1 station, the first 1.5 km wide, and the second 5 km wide. The outcomes we check for in each ring are turnover, employment, and productivity.[44]

D.39 We use difference in difference with propensity score matching to identify changes in productivity, turnover and employment around HS1 stations. Firms near HS1 stations are likely to have lower employment and turnover than similar firms near non-HS1 stations in 2019. This may be partly due to increased commuting, as employment is workplace-based.

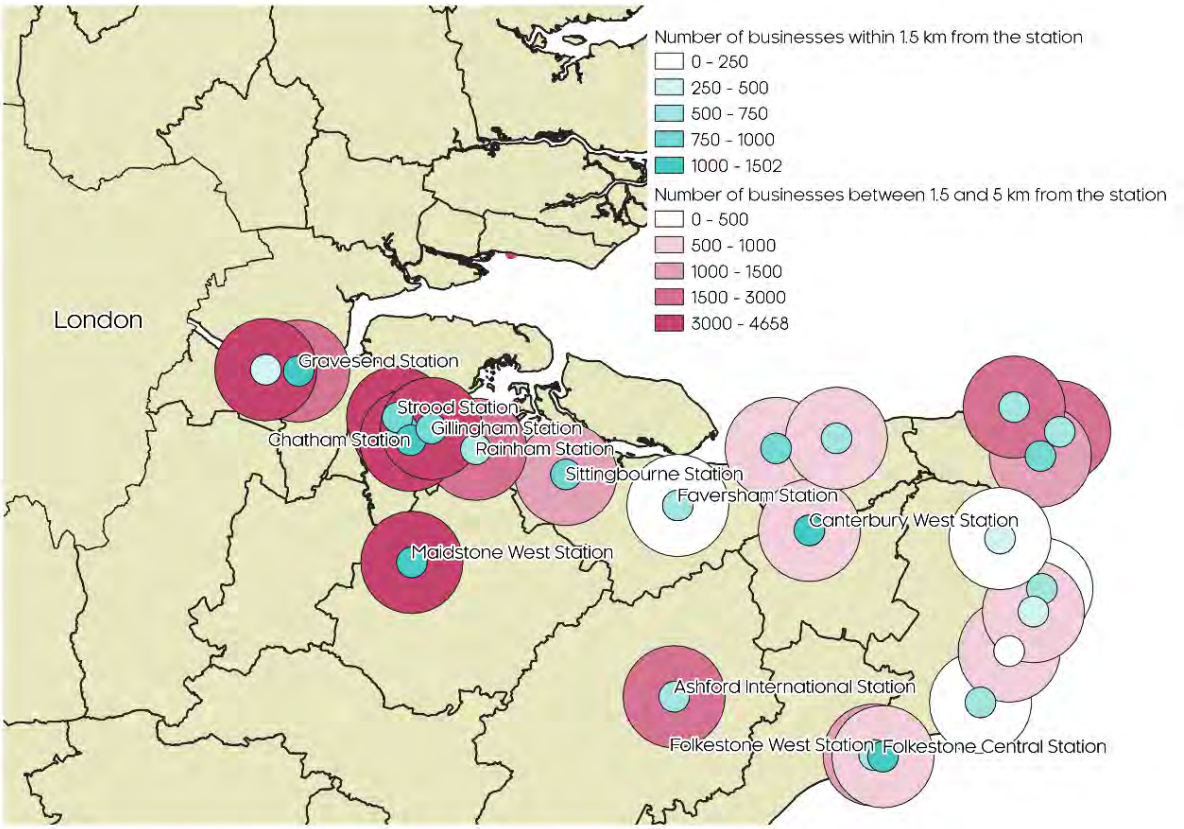
[44] productivity defined as turnover divided by employment

turnover and productivity are defined at the enterprise level, as turnover for local units is not available in the IDBR dataset.

Data description

D.40 We use data on the employment and turnover[45] of businesses and their branches near stations of interest. Figure D.15 below show the number of businesses in the area around stations with an HS1 connection.

Figure D.15: Number of businesses by proximity to stations served by HS1



Note(s): Only a selection of stations are named.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

D.41 In more rural stations further from London, businesses tend to be clustered closer to the station. It is important to note that there is significant overlap between the station catchment areas in Gillingham, Gravesend, Folkestone and Margate (north-east corner of Kent). In order to deal with duplicates (i.e. firms assigned to more than one station) we take a series of behavioural assumptions (see D.49 below).

D.42 TableD.3 below compares the area around stations served by HS1 to the area around other stations. Data is shown for 2008 and 2019, before and after HS1 is put in action.

[45] Turnover not available for branches, therefore approximated using the firms turnover per employee ratio.

Table D.3: Description of the areas within 1.5 km from a station, by HS1 status

	HS1 mean – 2008	HS1 mean - 2019	Non-HS1 mean – 2008	Non-HS1 mean – 2019
Number of businesses	650	756	414	498
Employment	4,674	5,073	2,637	3,013
Turnover (£ '000s)	355,721	437,812	217,365	273,707
Turnover per employee (£ '000s)	76	86	82	91

Notes: Sample includes 23 stations served by HS1 and 84 other stations at a similar distance from London.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

D.43 Here, we can see that the mean values for characteristics of the immediate area around the station (hereafter "inner ring") for our sample differ significantly between those served by HS1 stations and those not, even before the HS1 becomes operational in 2008.

D.44 On average, HS1 stations start with a higher number of businesses, and consequently turnover and level of employment. Still, non-HS1 stations are skewed upwards by Hove (Brighton), St Albans and Tunbridge Wells. That means that the non-HS1 sample of stations has a larger range and is therefore more heterogeneous. This makes sense, given the 24 HS1 stations are located around Kent, whereas the 84 comparison stations are picked from around the South West and East of England.

D.45 The highest number of businesses within 1.5 km of a station are seen around Hove Station in Brighton (4,019), which is not served by HS1. The HS1-served area with most businesses is Gravesend (1,502).

D.46 We used propensity score matching to compare similar areas and therefore reduce this bias. Table D.4 below shows the same statistics for the "outer ring", defined as the area between 1.5 and 5 km from the station as the crow flies.

Table D.4: Description of the areas between 1.5 and 5 km from a station, by HS1 status

	HS1 mean – 2008	HS1 mean - 2019	Non-HS1 mean – 2008	Non-HS1 mean – 2019
Number of businesses	1,395	1,766	1,759	2,149
Employment	9,227	10,864	10,452	11,885
Turnover (£ '000s)	761,463	993,482	865,579	1,321,339
Turnover per employee (£ '000s)	83	91	83	111

Notes: Sample includes 24 stations served by HS1 and 84 other stations at a similar distance from London.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

I. Method

D.47 Two models were run, examining the impact within and across stations.

- HS1 to non-HS1 stations
- The inner ring to the outer ring of HS1 stations.

The exact matching and outcome variables are described in Figure D.16 below.

Figure D.16: Variables used in the estimation of the propensity score

```
/*-------------------------------------------------------------------------
  VARIABLES USED IN THE ESTIMATION OF THE PROPENSITY SCORE:

  TREATMENT VARIABLE:
  hs1          - near station serviced by HS1

  VARIABLES IN THE PROPENSITY SCORE:
  close            - local unit within 1,500 metres of station
  sic07_1digit     - sector at the 1-digit level (41 sectors)
  size             - small (up to 49 employees) / medium (up to 249 employees) / large (250 or more employees)
  age              - difference between birth and death year of enterprise
  dem_2008         - passengers before the intervention takes place
  gjt_2008         - generalised journey time to central london before the intervention

  OUTCOME VARIABLES, BY LOCAL UNIT:
  employment_lu    - employment at each local unit
  turnover_lu      - turnover by local unit (approximated by employment)
  productivity     - turnover per employment (calculated at enterprise level)

 -------------------------------------------------------------------------*/
```

Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

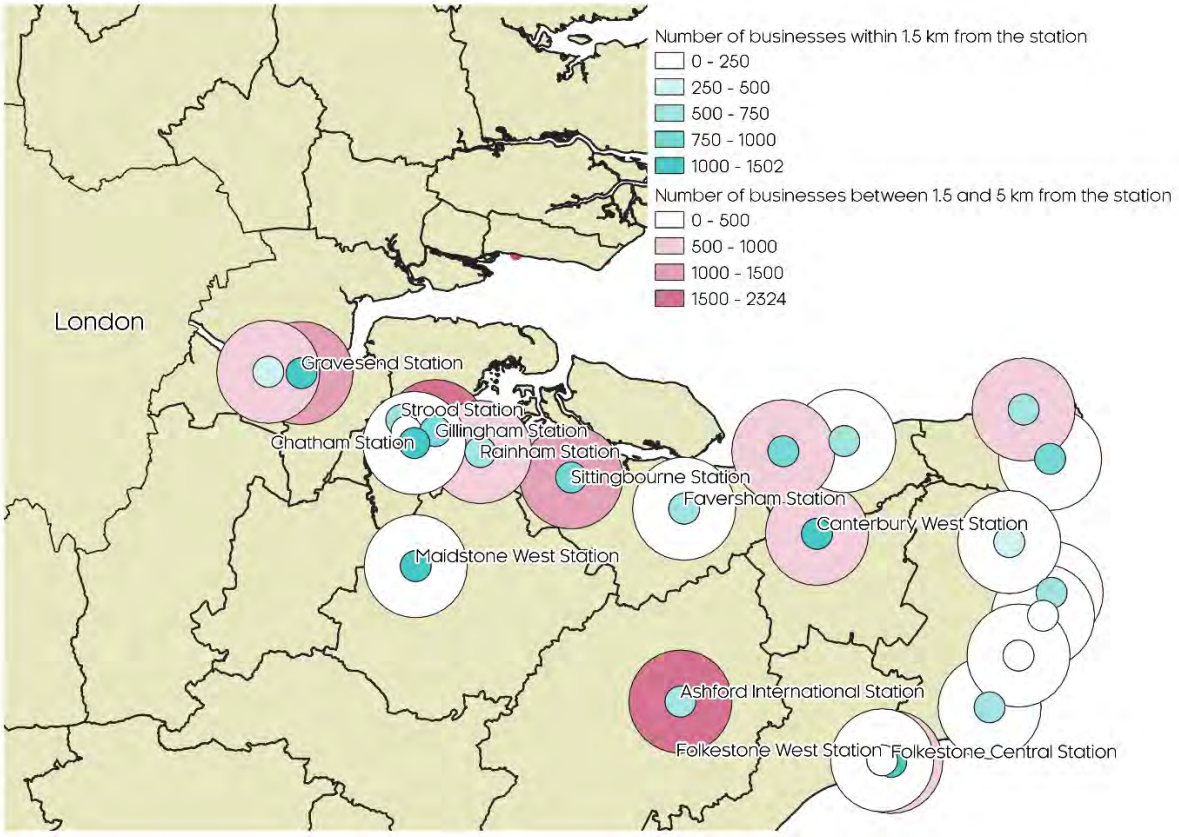
D.48 Running the difference in difference without any matching shows that HS1 stations were about £10k lower per employee than the comparator areas, and the difference remains constant until the latest data in 2019.

D.49 In order to deal with duplicates (i.e. firms assigned to more than one station) we take a series of behavioural assumptions. The preferred option is the station that gets you to central London the quickest and is within walking distance.[46] If no stations are within walking distance and you have to drive regardless, then you choose the station that gets you to central London the quickest again. The implication is that people will choose a slower connection within walking distance rather than driving.

D.50 The result is the map in Figure D.17 below.

[46] Walking distance defined as up to 1,500 metres as-the-crow-flies.

Figure D.17: Number of businesses by proximity to stations served by HS1, without duplicates



Note(s): Only a selection of stations are named.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

D.51 Most changes from the original dataset happen in the outer ring, because these locations are often closer to another station, and are therefore attributed there. For example, Maidstone West Station has three non-HS1 stations near it with a good connection to central London. This means that businesses in the outer ring are likely to be in the inner ring of one of these three non-HS1 stations, and therefore assigned in the control group.

II. Results

D.52 We examine four hypotheses and corresponding models, two at the firm level and two at the area level. An overview of the results is presented in Table D.5 below.

Table D.5: Firm level impact of HS1 Estimated for period 2007/8-2018/9: Difference-in-Difference with Propensity Score Matching Results

	Employment – estimate	Turnover (£000s) – estimate	Turnover per employment (£000s) – estimate	Sample size
a. Impact on inner-ring vs outer ring around an HS1 station	-0.8	-114***	-5.2	100,402 to 100,522
b. Impact on firms near an HS1 station vs non-HS1 comparators	0.2	-25	2.2	664,914 to 666,885
• Construction	-0.04	18	2.1	97,577 to 97,585
• Logistics	-1.0	126	17.2	18,398
• Retail	0.6	73	2.1	61,635
• Hospitality	-0.4	-6	2.3	42,257
• Knowledge-intensive businesses (KIBs)	-0.3	-144	-6.7	136,503 to 138,412

Notes: *** estimate is significant at a 95% confidence interval (1.96 times the standard error)
Turnover and turnover per employment are defined at enterprise level, whereas employment at the local unit level.
Outcomes estimated for 2018 and 2019, with the pre-intervention period defined as 2007 and 2008
Sample includes the area around 23 stations served by HS1 and 84 other stations at a similar distance from London.
Knowledge-Intensive businesses include finance, real estate, accounting, legal and other professional services
Hospitality: food and accommodation services
Source: Inter-Departmental Business Register; Cambridge Econometrics analysis

D.53 The results for analysis 'a' (first row of Table 5.6) show that the average turnover of firms with local units in the inner ring of an HS1 station experienced a less positive change over the study period when compared to the outer ring performance. This could be because:

a. existing firms with local units in the inner ring experienced a relatively larger decrease in turnover compared to firms with local units in the outer ring over the time period
b. existing firms with local units in the inner ring experienced a relatively smaller increase in turnover compared to firms with local units in the outer ring over the time period
c. a higher proportion of smaller, low-turnover firms entered the market or opened local units in the inner ring than in the outer ring over the time period, lowering the overall average turnover.

D.54 No significant effect is detected for employment and productivity.

D.55 The results for analysis 'b' (second row of Table 5.6) show that local unit performance does not differ significantly when located near an HS1 station compared to a non-HS1 station (as indicated by no asterisks against the numbers shown in that row). The comparators were controlled for variables of distance to London, enterprise sector, age, and distance from the station. Looking at firms by individual sector (rows 2 to 5 of the table), they do not differ significantly when located near an HS1 station compared to a non-HS1 station.

D.56 In order to test the impact on those firms locating a short drive away from the station, we isolate the area between 1.5 and 5 km form the station in Table D.6 below. This measures the

impact on firms in the outer ring around and HS1 station compared to those the same distance from a non HS1 station.

Table D.6: Firm level impact of HS1 (outer ring) 2007/8 – 2018/9: Difference in difference with Propensity Score Matching Results

	Employment – estimate	Turnover (£000s) – estimate	Turnover per employment (£000s) – estimate	Sample size
Impact on firms near a HS1 station (outer ring)	0.7***	26	1.9	477,261 to 478,924
Construction	0.3	55	-2.1	74,233 to 74,236
Retail	0.9	129	-5.3	40,142
Knowledge-intensive businesses (KIBs)	0.3	-60	-4.9	97.838 to 99,453

Notes: *** estimate is significant at a 95% confidence interval
Turnover and turnover per employment are defined at enterprise level, whereas employment at the local unit level.
Outcomes estimated for 2018 and 2019, with the pre-intervention period defined as 2007 and 2008
Sample includes the area around 23 stations served by HS1 and 84 other stations at a similar distance from London.
Knowledge-Intensive businesses include finance, real estate, accounting, legal and other professional services
Source: Inter-Departmental Business Register; Cambridge Econometrics analysis

D.57 These results show a significant positive change in employment per local unit in the outer ring (asterisks shown). There are no statistically significant results for other indicators or for individual sectors. The increase in employment per local unit in the outer ring of HS1 stations (1.5 to 5 km) could correspond to:

a. existing local units near HS1 stations experienced a relatively larger increase in employment compared to local units near non-HS1 stations over the time period
b. existing local units near HS1 stations experienced a relatively smaller decrease in employment compared to local units near non-HS1 stations over the time period
c. a higher proportion of smaller, low-employment local units firms entered the market near non-HS1 stations compared to HS1 stations over the time period, lowering the overall average employment.

Descriptive data for treated and comparator areas used, LAD level

Table D.7: Full list of stations and associated data

	GDP - 2018	GVA per capita – 2018	GDP – Change 2008-18	GVA per capita – Change 2008-18	Population – Change 2008-18
HS1					
Ashford	3,518	19.5	14%	-2%	13%
Canterbury	3,807	16.0	12%	-6%	13%
Dartford	4,370	30.7	16%	-6%	17%
Dover	2,830	17.6	5%	-10%	7%
Gravesham	2,020	12.5	16%	6%	7%

	GDP - 2018	GVA per capita – 2018	GDP – Change 2008-18	GVA per capita – Change 2008-18	Population – Change 2008-18
Maidstone	4,832	20.6	14%	-3%	14%
Medway	6,456	16.8	18%	8%	8%
Swale	3,388	15.2	7%	-17%	13%
Thanet	2,561	11.6	14%	-5%	8%
Non-HS1					
Southend-on-Sea	3,608	13.2	10%	-6%	8%
Wokingham	7,602	38.0	36%	24%	10%
Brighton and Hove	9,360	24.0	26%	17%	11%
Portsmouth	6,642	23.0	19%	-5%	10%
Southampton	8,719	27.5	4%	-7%	11%
East Cambridgeshire	2,236	18.1	20%	6%	10%
Huntingdonshire	5,123	21.9	15%	8%	7%
South Cambridgeshire	5,995	30.5	31%	20%	10%
Eastbourne	2,188	14.2	6%	1%	5%
Hastings	1,849	13.3	11%	2%	5%
Lewes	2,212	13.5	12%	1%	8%
Rother	1,577	9.0	7%	-3%	6%
Wealden	3,133	11.7	13%	-1%	9%
Braintree	4,192	20.3	31%	30%	5%
Brentwood	3,682	36.4	41%	29%	7%
Colchester	4,858	18.5	25%	5%	15%
Tendring	2,339	9.9	8%	-9%	4%
Uttlesford	2,652	20.4	19%	-3%	18%
Basingstoke and Deane	7,480	37.6	3%	4%	8%
East Hampshire	3,032	16.5	8%	-6%	7%
Fareham	3,409	20.8	20%	20%	6%
New Forest	5,242	20.0	13%	9%	3%
Winchester	5,990	36.9	32%	17%	10%
Hertsmere	4,778	35.9	30%	24%	7%
Watford	5,685	49.9	48%	29%	14%
Sevenoaks	4,642	27.5	38%	33%	6%
Tonbridge and Malling	4,864	27.4	11%	-3%	12%
Tunbridge Wells	3,908	24.7	13%	7%	6%

	GDP - 2018	GVA per capita – 2018	GDP – Change 2008-18	GVA per capita – Change 2008-18	Population – Change 2008-18
Elmbridge	6,534	35.1	45%	47%	5%
Guildford	5,580	27.5	11%	1%	12%
Reigate and Banstead	6,457	35.9	-16%	-24%	11%
Tandridge	2,213	15.4	8%	-2%	7%
Waverley	3,642	19.5	-4%	-15%	6%
Arun	2,888	10.8	15%	9%	8%
Chichester	3,825	23.2	13%	6%	8%
Crawley	6,791	49.4	22%	11%	9%
Worthing	4,147	28.7	20%	4%	7%
St Albans	4,949	23.7	25%	15%	8%
East Hertfordshire	4,494	24.6	-9%	-17%	10%

Notes: Sample includes 9 local authority districts served by HS1 and 40 not served by HS1
Change is calculated as the percentage change from 2008 to 2018.
Source: CE Regional Data; Cambridge Econometrics analysis

Descriptive data for stations and comparators, Firm level

Table D.8: Full list of stations and associated data

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
HS1						
Ashford International Station	618	10%	-7%	18%	23%	5%
Canterbury West Station	2074	15%	26%	34%	36%	2%
Chatham Station	5456	40%	47%	31%	75%	33%
Deal Station	1112	20%	31%	23%	37%	12%
Dover Priory Station	597	11%	16%	-6%	38%	46%
Ebbsfleet International Station	814	105%	131%	78%	171%	52%
Faversham Station	589	23%	23%	35%	41%	6%
Folkestone Central Station	2144	35%	46%	30%	28%	-3%

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
Folkestone West Station	502	34%	12%	64%	31%	-20%
Gillingham Station	4415	42%	57%	48%	28%	-19%
Gravesend Station	3004	61%	52%	36%	21%	-11%
Herne Bay Station	760	23%	28%	20%	25%	3%
Maidstone West Station	4891	25%	-3%	6%	29%	21%
Margate Station	1814	28%	57%	21%	4%	-15%
Martin Mill Station	36	31%	0%	-4%	11%	16%
Rainham Station	1062	29%	18%	-4%	-46%	-43%
Ramsgate Station	2787	48%	77%	15%	45%	27%
Rochester Station	289	68%	67%	101%	128%	7%
Sandwich Station	275	23%	18%	32%	47%	11%
Sittingbourne Station	820	13%	14%	-9%	0%	9%
Strood Station	4376	39%	63%	23%	13%	-9%
Walmer Station	574	33%	110%	32%	71%	29%
Whitstable Station	822	36%	36%	35%	35%	-1%
Non-HS1						
Adisham Station	49	20%	0%	28%	67%	30%
Arundel Station	548	31%	44%	30%	27%	-2%
Ashurst New Forest Station	107	37%	-3%	22%	42%	16%
Ashurst Station	43	13%	85%	-8%	72%	87%
Aylesford Station	1067	29%	48%	14%	41%	23%
Barming Station	1323	57%	46%	56%	39%	-26%

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
Basingstoke Station	842	46%	75%	-11%	-19%	-9%
Bat & Ball Station	527	21%	68%	-25%	-52%	-36%
Bayford Station	40	44%	22%	19%	-3%	-15%
Bearsted Station	779	46%	31%	71%	67%	-2%
Bitterne Station	634	32%	56%	-1%	27%	29%
Botley Station	327	12%	52%	32%	47%	11%
Byfleet & New Haw Station	624	34%	44%	64%	392%	194%
Chalkwell Station	1607	59%	81%	40%	7%	-24%
Chappel & Wakes Colne Station	77	13%	79%	-15%	-3%	16%
Cheddington Station	59	13%	7%	29%	107%	60%
Chilham Station	70	8%	25%	8%	23%	17%
Colchester Station	889	14%	-3%	57%	47%	-6%
Cooden Beach Station	179	41%	85%	28%	81%	43%
Cooksbridge Station	94	1%	-9%	9%	18%	9%
Cosham Station	762	37%	25%	70%	106%	24%
Cowden Station	76	71%	367%	55%	92%	24%
Cressing Station	254	56%	80%	51%	57%	4%
Cuxton Station	716	44%	36%	28%	-14%	-33%
Dormans Station	146	4%	13%	67%	52%	-8%
Dullingham Station	22	23%	250%	-4%	-71%	-70%
Dumpton Park Station	879	47%	60%	53%	62%	7%

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
East Malling Station	786	50%	62%	27%	167%	110%
Eastbourne Station	1505	20%	18%	14%	20%	5%
Elstree Station	1270	85%	95%	41%	0%	-28%
Flitwick Station	487	21%	14%	36%	54%	12%
Frant Station	120	15%	-48%	19%	16%	-2%
Frimley Station	652	31%	40%	105%	107%	-3%
Glynde Station	46	-3%	29%	5%	22%	17%
Gomshall Station	90	7%	42%	4%	-2%	-7%
Goring-by-Sea Station	863	30%	16%	22%	-5%	-21%
Headcorn Station	155	19%	39%	-4%	-22%	-19%
Higham Station	341	12%	8%	291%	-10%	-77%
Hove Station	4019	54%	59%	51%	61%	6%
Ifield Station	517	44%	75%	20%	98%	66%
Kelvedon Station	278	33%	99%	50%	204%	96%
Kirby Cross Station	95	31%	9%	26%	37%	8%
Lewes Station	2412	23%	46%	15%	64%	42%
Liss Station	226	11%	32%	2%	-10%	-11%
Littlehampton Station	1412	37%	40%	28%	50%	18%
Marks Tey Station	180	14%	51%	41%	14%	-19%
Meldreth Station	217	13%	22%	12%	-9%	-21%
Milford Station	258	26%	50%	23%	42%	14%
Minster Station	95	27%	46%	34%	38%	3%
Newhaven Town Station	341	27%	49%	43%	43%	1%

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
Newport Station	108	-7%	6%	8%	59%	47%
Nutbourne Station	141	33%	5%	33%	52%	14%
Pevensey & Westham Station	114	9%	-19%	27%	47%	17%
Plumpton Station	227	112%	284%	28%	168%	110%
Princes Risborough Station	348	6%	26%	14%	186%	153%
Queenborough Station	120	48%	50%	240%	275%	9%
Rowlands Castle Station	122	8%	33%	18%	8%	-7%
Roydon Station	103	20%	79%	3%	-26%	-29%
Salfords Station	193	29%	69%	15%	35%	18%
Sandling Station	43	-14%	0%	29%	21%	2%
Shawford Station	210	16%	2%	19%	94%	64%
Shenfield Station	727	55%	77%	41%	54%	9%
Shoeburyness Station	418	24%	37%	6%	53%	44%
St Albans Station	2364	53%	46%	14%	65%	41%
St Denys Station	2468	34%	27%	11%	26%	13%
St Neots Station	408	33%	79%	18%	48%	25%
Sturry Station	287	19%	43%	85%	70%	-8%
Swanwick Station	939	17%	20%	10%	-41%	-46%
Taplow Station	378	30%	57%	27%	21%	-4%
Tunbridge Wells Station	3933	29%	37%	19%	33%	12%
Twyford Station	466	36%	42%	64%	22%	-26%

	Number of businesses - 2019	Number of businesses % Change	Number of KIBs % Change	Employment % Change	Turnover % Change	Productivity % Change 2008-19
Uckfield Station	519	6%	12%	12%	3%	-8%
Wateringbury Station	596	7%	-10%	-9%	-47%	-41%
Watford High Street Station	1326	59%	86%	41%	18%	-15%
Watford Junction Station	3796	70%	94%	50%	45%	-4%
West St Leonards Station	574	34%	47%	34%	45%	8%
Westgate-on-Sea Station	421	32%	35%	28%	30%	7%
White Notley Station	82	46%	75%	40%	183%	101%
Wivelsfield Station	729	28%	29%	17%	21%	4%
Worthing Station	3531	20%	37%	24%	48%	18%
Wye Station	125	70%	76%	44%	37%	-4%
Yalding Station	180	13%	150%	26%	51%	18%

Notes: Sample includes 23 stations served by HS1 and 83 other stations at a similar distance from London.
% Change is calculated as the percentage change from the average of 2007-08 to the average of 2018-19.
Source: Inter-Departmental Business Register, 2019; Cambridge Econometrics analysis

Limitations

D.58 There are certain factors beyond our control that could have affected the results. Dealing with an intervention over more than ten years old may mean that results are clouded by other changes happening over the same time period.

D.59 Also, the severance of natural and man-made features in accessing the station is a factor. Because distance is measured as the crow flies, natural and man-made obstacles may mean that access to a station is harder than it seems from the data. While large features like the River Thames have been taken account to exclude postcodes on the opposite side, smaller rivers and barriers like highways are not taken into account.

D.60 We have also taken a series of behavioural assumptions to eliminate duplicate firms in our sample. Therefore, each postcode has been assigned to the quickest station that is within walking distance.

E Qualitative analysis

Topic Guide 1: Local Authorities

Introduction

1. Please briefly outline your job role and (if relevant) the geographic or sectoral scope of your role.
2. What effects do you think HS1 has had on the local area, and why?

Land Use

3. I'd like to talk to you about changes in the use of land in areas around stations with high-speed service using HS1.
    i. What changes (if any) have occurred? Probe for the following, and for each one probe for evidence (e.g. 'what makes you say this?'):
        a. land use (housing, commercial, public space et.)
        b. types of businesses
        c. density of developments
        d. price and availability of commercial space.
    ii. What factors made these changes happen (probe for local contextual factors)?
    iii. Were there any factors which prevented change, or made these changes difficult?

4. How have Local Authorities amended their development plans or activities in response to the introduction of high-speed services using HS1?
    i. What have Local Authorities done to incentivise activity in areas around stations?
    ii. What has worked well, or not so well, and why?

5. How would you say commercial developers have responded to the introduction of high-speed services using HS1?
    i. Have plans for the new housing developments been affected? If so, how (e.g. type, location…)?
    ii. What factors contributed to these changes or were necessary for them to come about?
    iii. Were there any factors which prevented change, or made these changes difficult?

Businesses

Next I'd like to talk about the effects on businesses of high-speed services using HS1.

6. What opportunities does HS1 present for businesses?
7. What risks does HS1 present for businesses?

8. How have the impacts on business varied by sector and local geography?
9. What has been the impact of additional connectivity:
    i. to London?
    ii. within Kent?
    iii. Internationally?

    Probe for possible impacts such as access to customers, access to labour markets, access to others (e.g. collaborators) for meetings/events, change in competitor activity.

10. What growth or decline has there been in businesses operating around stations (e.g. local transport firms and other station related businesses), and why?
11. To what extent has there been a change in FDI or foreign businesses being established or expanding or contracting as a result of the additional connectivity?

Community impacts

12. I'd like to talk to you about changes in the demographic makeup of the community in areas around stations with high-speed service using HS1.
    i. What changes (if any) would you say have occurred? Probe for the following, and for each one probe for evidence (e.g. 'what makes you say this?'):
        a. Average age, ethnicity and gender
        b. Life stage
        c. Income levels
        d. Population size and growth rates
    ii. How and why have these changes occurred?
    iii. How does these changes differ by area?
    iv. What are the implications of these changes for the local area (for example, on supporting infrastructure/provisions, or on the types of services available in the local economy?)

13. To what extent do local residents use the HS1 services?
    i. Do local people use the services for commuting? Why/why not?
    ii. Have the high speed services had any other impacts on local people's ability to access work? Why?
    iii. Aside from commuting, to what extent do local people use the high speed services? For what purposes?

Unexpected impacts or lack of impacts

14. What have been the 'knock-on' or wider impacts of the changes we have discussed?
15. Have there been any negative consequences for local areas? What about for neighbouring areas not served by HS1?
16. Are there any examples of the expected/intended impacts of HS1 not occurring?
    i. Why has this been the case (probe for local contextual factors)?
    ii. What lessons can we learn?

17. Who else do you think we should talk to about the topics we have discussed today?
18. We've discussed land use, businesses, community impacts and wider impacts. Is there anything else we haven't covered today which you'd like to add?

Thank & Close

Interviewer to explain:

- The research will be completed within the next few months and will be published on the DfT website.
- Any follow-up questions or additional comments can be sent to Emma Hanes (email address provided in the consent form).

Topic Guide 2: Business Overarching Groups

Introduction

1. Please briefly outline your job role and the organisation you work for (e.g. how many businesses the organisation represents, what types)
2. What effects do you think HS1 has had on the local area, and why?

Businesses

I'd like to talk about the effects of high-speed services using HS1 on the businesses you represent.

3. What opportunities does HS1 present for businesses?
4. What risks does HS1 present for businesses?
5. How have the impacts on business varied across the sectors/types you represent and by geography?
6. What has been the impact of additional connectivity:
    i. to London?
    ii. within Kent?
    iii. Internationally?

    Probe for possible impacts such as:
    i. access to customers
    ii. access to labour markets
    iii. access to others (e.g. collaborators) for meetings/events
    iv. change in competitor activity.

7. [If relevant] What growth or decline has there been in businesses operating around stations (e.g. local transport firms and other station related businesses), and why?
8. [If relevant] To what extent has there been a change in FDI or foreign businesses being established or expanding or contracting as a result of the additional connectivity?

Land Use

9. I'd like to talk to you about changes in the use of land in areas around stations with high-speed service using HS1, and what this has meant for businesses.
    i. What changes (if any) have occurred? Probe for the following, and for each one probe for evidence (e.g. 'what makes you say this?'):
        a. types of businesses
        b. price and availability of commercial space
    ii. What factors made these changes happen (probe for local contextual factors)?
    iii. Were there any factors which prevented change, or made these changes difficult?

10. [If relevant] How have commercial developers responded to the introduction of high-speed services using HS1?
    i. Have plans for the new housing developments been affected? If so, how (e.g. type, location…)?
    ii. What factors made these changes happen?
    iii. Were there any factors which prevented change, or made these changes difficult?

Unexpected impacts or lack of impacts

11. What have been the 'knock-on' or wider impacts of the changes we have discussed?
12. Have there been any negative consequences for businesses in the local areas? What about for businesses in neighbouring areas not served by HS1?
13. Are there any examples of the expected or intended impacts of HS1 not occurring?
    i. Why has this been the case (probe for local contextual factors)?
    ii. What lessons can we learn?
14. We would like to speak to businesses who have been affected in some of the ways we've discussed today. Would you be willing to introduce us to a selection of suitable businesses?
15. We've discussed land use, businesses, community impacts and wider impacts. Is there anything else we haven't covered today which you'd like to add?

Thank & Close

Interviewer to explain:

- The research will be completed within the next few months and will be published on the DfT website.
- Any follow-up questions or additional comments can be sent to Emma Hanes (email address provided in the consent form).

Topic Guide 3: Businesses

Introduction

1. Please briefly outline your job role and some basic information about your company:
    i. What services/products does the company offer?
    ii. How many employees are there?
    iii. What geography does the company operate over?

2. What effects do you think HS1 has had on your business, and why?

Businesses

I'd like to talk about the effects of high-speed services using HS1 on your business.

3. What opportunities does HS1 present for you?
4. What risks does HS1 present for you?
5. What has been the impact of additional connectivity:
    i. to London?

ii. within Kent?
iii. Internationally?

Probe for possible impacts such as:
iv. access to customers
v. access to labour markets
vi. access to others (e.g. collaborators) for meetings/events
vii. change in competitor activity.

Land Use

6. I'd like to talk to you about changes in the use of land in areas around stations with high-speed service using HS1, and what this has meant for your business.

   i. What changes (if any) have occurred? Probe for the following, and for each one probe for evidence (e.g. 'what makes you say this?'):
      a. types of businesses
      b. price and availability of commercial space
   ii. What has been the effect of these changes on your business?
   iii. What factors made these changes happen (probe for local contextual factors)?
   iv. Were there any factors which prevented change, or made these changes difficult?

7. [If relevant] How have commercial developers responded to the introduction of high-speed services using HS1?

   i. Have plans for the new housing developments been affected? If so, how (e.g. type, location…)?
   ii. What factors made these changes happen?
   iii. Were there any factors which prevented change, or made these changes difficult?

Community impacts

8. I'd like to talk to you about changes in the demographic makeup of the community in areas around stations with high-speed service using HS1, and how this has affected your business.

   iv. What changes (if any) would you say have occurred? Probe for the following, and for each one probe for evidence (e.g. 'what makes you say this?'):
      a. Average age, ethnicity and gender
      b. Life stage
      c. Income levels
      d. Population size and growth rates
   v. What impact (if any) have these changes had on your business? (for example changes in customer demography, changes in employee base etc.).

Unexpected impacts or lack of impacts

9. What have been the 'knock-on' or wider impacts of the changes we have discussed?

10. Have there been any negative consequences for businesses in the local areas? What about for businesses in neighbouring areas not served by HS1?

11. Are there any examples of the expected/intended impacts of HS1 not occurring?

    vi. Why has this been the case (probe for local contextual factors)?
    vii. What lessons can we learn?

12. We would like to speak to other businesses who have been affected in some of the ways we've discussed today. Would you be willing to introduce us to some of your contacts – either from your sector or from others?
13. We've discussed land use, businesses, community impacts and wider impacts. Is there anything else we haven't covered today which you'd like to add?

Thank & Close

Interviewer to explain:

- The research will be completed within the next few months and will be published on the DfT website.
- Any follow-up questions or additional comments can be sent to Emma Hanes (email address provided in the consent form).

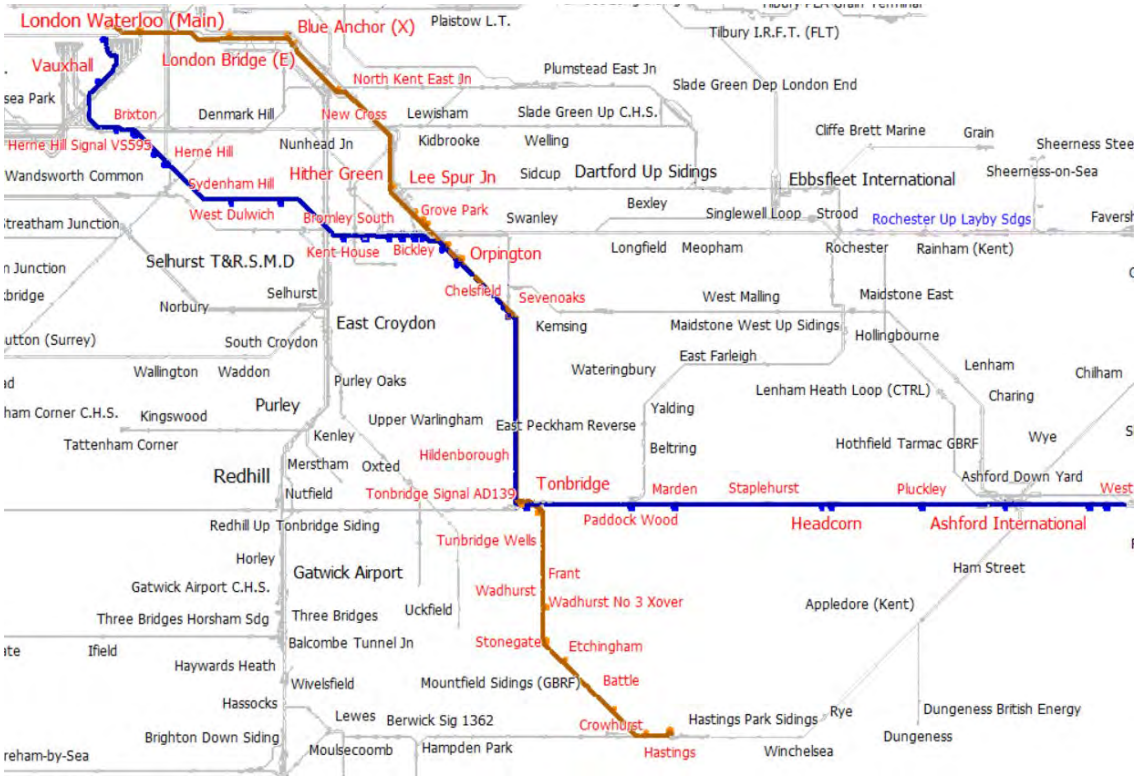
F Counterfactual Scenario timetable analysis

South Eastern services

6020 London - Hastings/Tunbridge Wells via Tonbridge

F.1 These services share running lines with international passenger services between Bickley Junction and Tonbridge. This is shown in Figure F.1 below.

Figure F.1: Routeing of services in Service group 6020 compared to Eurostar routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

F.2 The December 2019 timetable pattern for this service group is not compatible with operating international passenger services to Waterloo and therefore needs amending.

F.3 In the Up direction towards London the xx:21 Tunbridge Wells – Charing Cross service conflicts with/runs through the international passenger service arriving at Waterloo at xx:09. In the Down direction from London the xx:45 Charing Cross to Hastings services would run through the xx:53 Eurostar departure from Waterloo.

F.4 To solve this issue the service group has been amended to match a pre-2003 timetable which is compatible with operating international passenger services to Waterloo. The off-peak pattern is broadly the same as December 2019 with two trains per hour between both Hastings and Tunbridge Wells operating in different timings. Fewer services operate in total, with a reduction in early morning, late evening and peak services.

6040 London – Ramsgate/Dover via Chatham

F.5 This service group has primarily been amended to balance connectivity between London and East Kent following the removal of the domestic high-speed services from the Counterfactual modelling timetable.

F.6 In the Counterfactual scenario this service groups reverts to the service pattern which operated before domestic high-speed services operated.

F.7 The December 2019 timetable pattern is:

- London Victoria – Dover via Canterbury East – semi fast
- London Victoria – Dover via Canterbury East – stopping
- London Victoria – Ramsgate – semi fast.

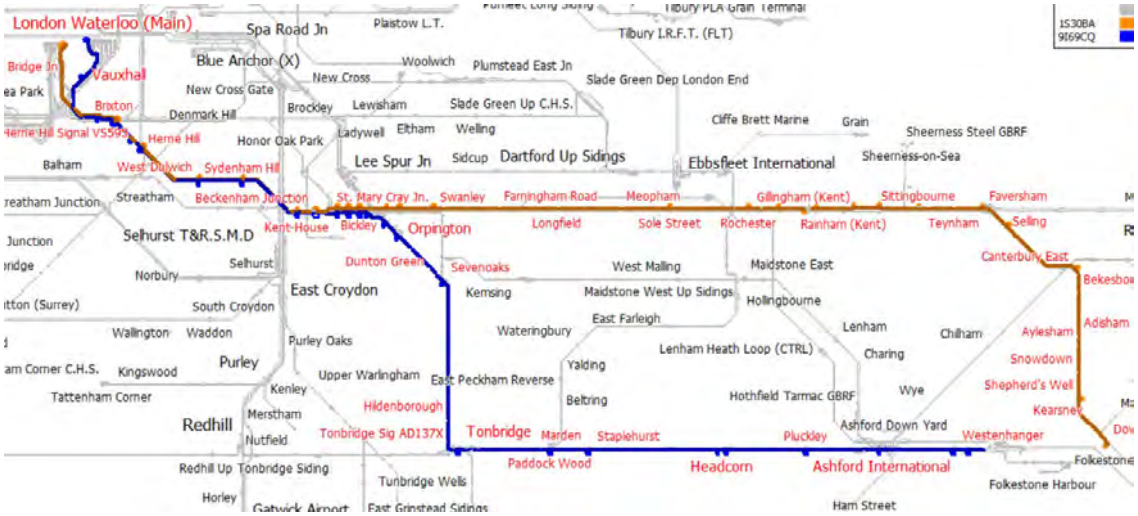
F.8 The Counterfactual service pattern is:

- London Victoria – Ramsgate and Dover – semi fast, split at Faversham
- London Victoria – Ramsgate and Dover – stopping, split at Faversham
- London Victoria – Ramsgate – semi fast
- London Victoria – Faversham – semi fast.

F.9 Compared to the December 2019 timetable this service pattern creates faster journey times to London Victoria from Ramsgate and Dover to make up for the lack of domestic high-speed services. The fastest journey time between London Victoria and Dover or Ramsgate is around 20 minutes faster in the Counterfactual compared to the non-domestic high-speed December 2019 position.

F.10 These services also share running lines with international passenger services between Voltaire Road Junction and Bickley Junction although no direct conflicts were found when overlaying the Eurostar services onto the December 2019 timetable. This is shown in Figure F.2 below.

Figure F.2: Routeing of services in Service group 6040 compared to international passenger service routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

6050 London – Ramsgate/Dover via Ashford

F.11 This service group has primarily been amended to reinstate connectivity to East Kent following the removal of the domestic high-speed services from the Counterfactual modelling timetable.

F.12 In the Counterfactual scenario this service groups reverts to the service pattern which operated before domestic high-speed services operated.

F.13 The December 2019 timetable pattern is:

- London Charing Cross – Dover – stopping
- London Victoria – Ramsgate via Canterbury West – stopping:
  - In some hours this splits at Ashford with an additional portion running to Ramsgate via Dover.

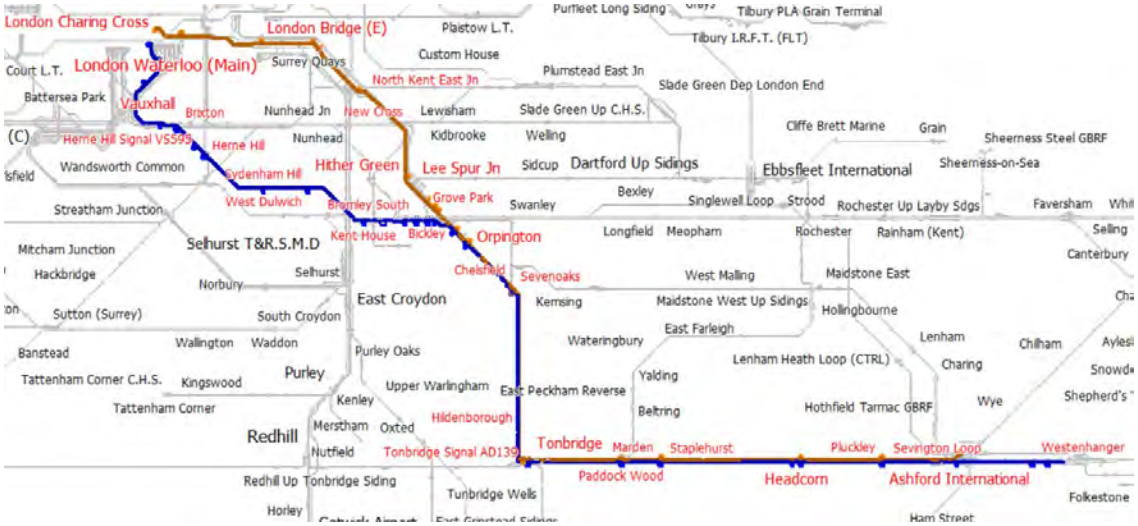
F.14 The Counterfactual service pattern is:

- London Charing Cross – Margate via Canterbury West and Ramsgate via Dover. Split at Tonbridge
- London Charing Cross – Dover – stopping.

F.15 Compared to the December 2019 timetable this service pattern creates faster classic rail journey times to London Victoria from Ramsgate and Dover to make up for the lack of HS1 service. The fastest journey time between London Victoria and Dover or Ramsgate is around 20 minutes faster in the Counterfactual compared to the December 2019 position.

F.16 These services also share running lines with international passenger services between Bickley Junction and Ashford. This is shown in Figure F.3: below.

Figure F.3: Routeing of services in Service group 6050 compared to international passenger service routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

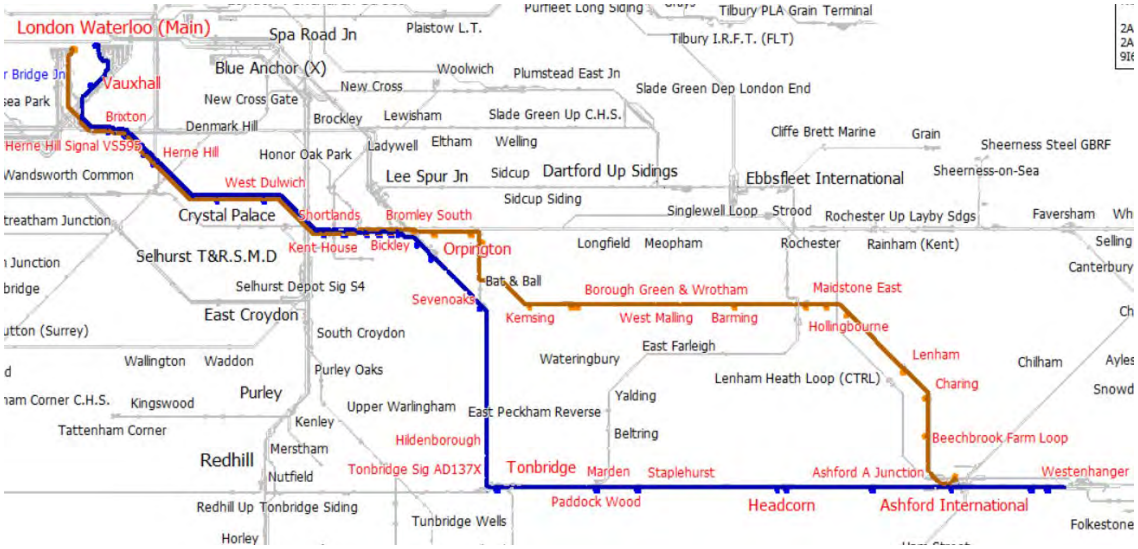
F.17 Numerous conflicts were found when overlaying the international passenger services onto the December 2019 timetable, in particular on the two-track section between Tonbridge and Ashford with services in both directions conflicting in a repeating pattern every half hour.

F.18 Each service in the 6050 service group conflicts with one of the international passenger service paths. Changing the service group to the pre 2003 service pattern results in a conflict free timetable on this route section.

6060 London to Ashford via Maidstone

F.19 These services share running lines with Eurostar services between Voltaire Road Junction and Bickley Junction. This is shown in Figure F.4 below.

Figure F.4: Routeing of services in Service group 6060 compared to international passenger service routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

F.20 The December 2019 timetable pattern for this service group is not compatible with operating the Eurostar service to Waterloo and would need amending.

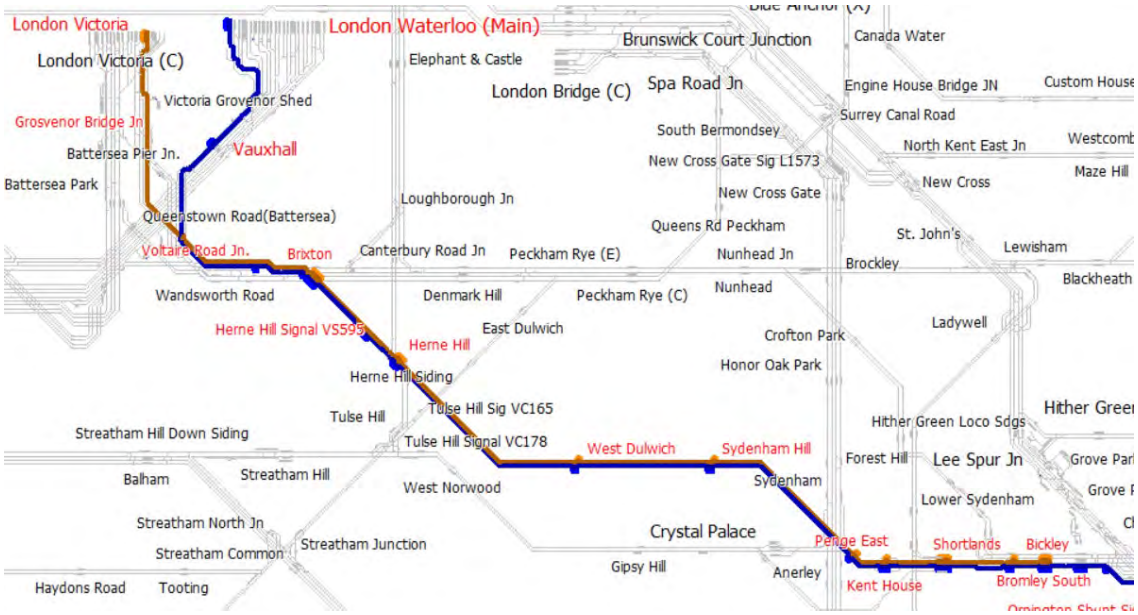
F.21 In the Up direction towards London the xx:36 arrival at London Victoria from Ashford, and the xx:06 arrival at London Victoria from Canterbury West both conflict with international passenger service paths every half hour.

F.22 The 6060 service group has therefore been amended to match a pre-2003 timetable which is compatible with operating international passenger service services to Waterloo. The off-peak pattern still includes one train per hour between London Victoria and Ashford. It also includes a fast London Cannon Street to Ashford service and a London Victoria to Maidstone East service.

6520 London - Bromley South/Orpington via Herne Hill

F.23 These services share running lines with Eurostar services between Voltaire Road Junction and Bickley. This is shown in Figure F.5 below.

Figure F.5: Routeing of services in Service group 6520 compared to international passenger service routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

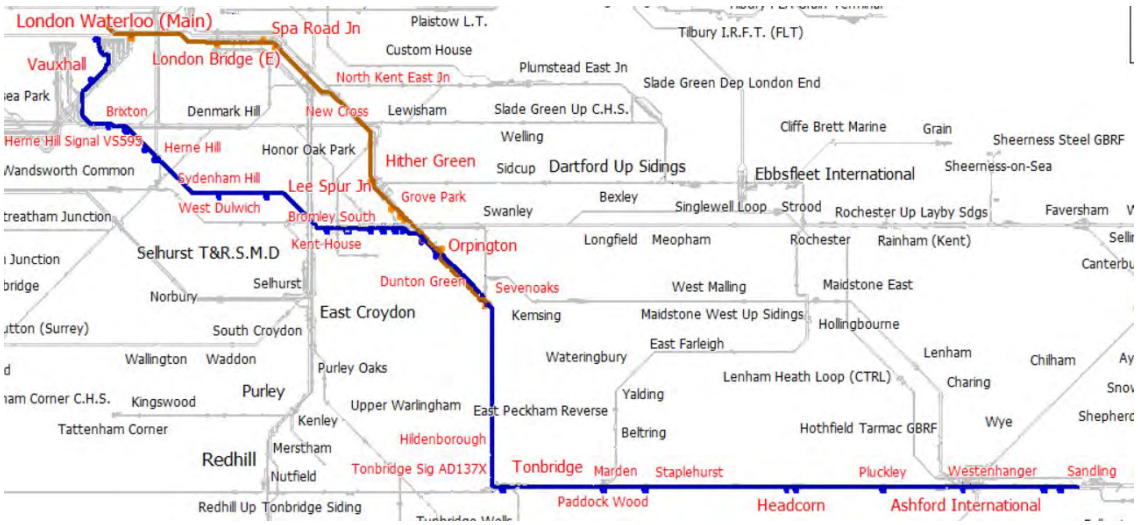
F.24 The London Victoria to Bromley South services conflict with Eurostar paths on this section every half hour. The xx:18 and xx:48 arrivals at London Victoria conflict/run through the international passenger service paths. The xx:43 departure also conflicts. It does not appear possible to operate the London Victoria – Bromley South services, they have all been removed from the Counterfactual timetable.

F.25 The London Victoria – Orpington services do not conflict with the international passenger service paths, these services have therefore been retained in the Counterfactual timetable.

6550 London - Orpington/Sevenoaks via Grove Park

F.26 These services share running lines with Eurostar services between Bickley Junction and Sevenoaks. This is shown in Figure F.6 below.

Figure F.6: Routeing of services in Service group 6550 compared to international passenger service Eurostar routeing



Note: International passenger service routeing shown in blue, South Eastern service shown in gold.

F.27 The result of overlaying Eurostar paths to/from Waterloo onto the December 2019 timetable is South Eastern services conflicting with the international passenger service paths on the two track section between Orpington and Sevenoaks every half hour in a repeating pattern.

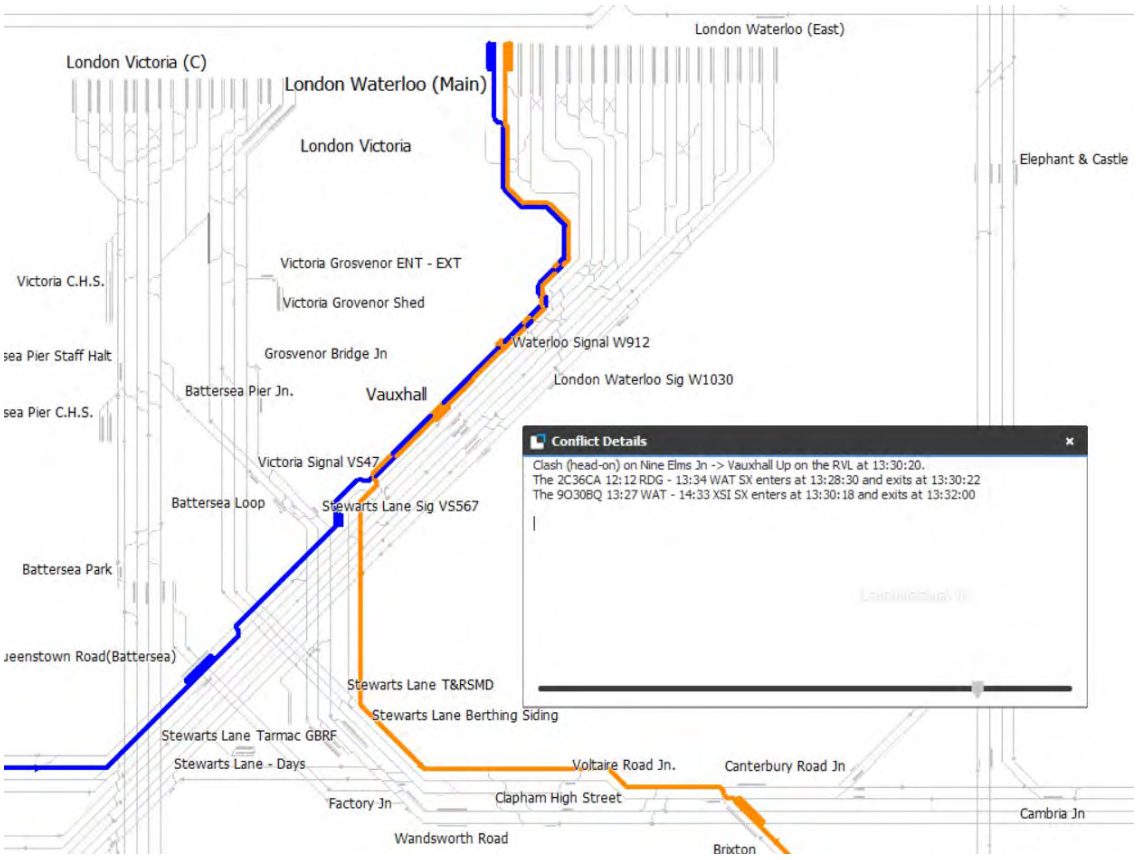
F.28 The xx:27 and xx:57 arrivals at London Charing Cross from Sevenoaks conflict with the Eurostar paths as do the xx:04 and xx:34 departures from London Charing Cross to Sevenoaks.

F.29 The service group has been amended to match a pre-2003 timetable which is compatible with operating Eurostar services to Waterloo. The off-peak pattern reduces the frequency compared to the December 2019 timetable to one train per hour between Sevenoaks and London instead of two trains per hour.

South Western services

F.30 Many Windsor line services such as the Reading – Waterloo service highlighted in the figure below are routed on the Windsor Reversible (RVL) running line in the 2019 timetable. Overlaying the international passenger service paths onto the timetable shows these are also planned to run on the RVL line. This is illustrated in Figure F.7 below.

Figure F.7: Routeing of SW Windsor Line service compared to Eurostar services



Note: international passenger service routeing shown in blue, South Western service shown in gold.

F.31 This creates numerous conflicts. In order to resolve these conflicts, we have taken the Windsor line services back to the December 2017 timetable. This affects service groups 6710 and 6720 including the following services:

- Waterloo - Weybridge
- London Waterloo - Hounslow

- Waterloo - Waterloo Via New Malden and Twickenham
- Waterloo - Waterloo Via Twickenham and New Malden
- Waterloo - Shepperton
- Waterloo - Reading
- Waterloo - Aldershot/Guildford.

G Operating cost analysis

Operating cost drivers

G.1 The operating cost items have been categorised in Table G.1, Table G.2 and Table G.3 below, along with the timetable inputs which affect each, and the indexation rates used to inflate/deflate the costs.

Table G.1: Shared Costs

Item	Driven by	Growth index
Rolling Stock Lease	Number of Vehicles required in	RPI
Rolling Stock Maintenance	Vehicle Miles	RPI
Staff Costs	Train Hours	AWE

Source: Steer, RPI is Retail Price Index. AWE is Average Weekly Earnings

Table G.2: Conventional Access Charges

Item	Driven by	Growth index
Electricity	Vehicle miles	Electricity prices
Variable Usage Charges (VUC)	Vehicle miles	CPI

Source: Steer, CPI is Consumer Price Index

Table G.3: HS1 Track Access Charges

Item	Driven by	Growth index
Investment Recovery Charge (IRC)	Number of trains and journey	RPI
Additional Investment Recovery Charge (AIRC)	Number of trains and journey	RPI
Operations, Maintenance and Renewal Charge	Number of trains and journey	RPI
Electricity	Vehicle miles/kilometres	Electricity
Station Access Charges	Number of trains	RPI

Source: Steer

G.2 Charges and costs are only calculated where a difference would occur between the Outturn and Counterfactual scenario. Fixed Track Access Charges paid to Network Rail from TOCs are not included in our analysis.

G.3 The change in cost of Station access charges has only been estimated where there is a clear difference between the Outturn and Counterfactual scenario.

Timetable Inputs

G.4 The difference in vehicle miles and train hours between the Actual and Counterfactual has been calculated by taking the modelled timetables from MOIRA2.2. The mileages are based on the station-to-station distances built into the MOIRA geography.

G.5 The change in vehicle miles is annualised from daily mileage, derived from MOIRA (i.e. for each modelled timetable in MOIRA, the incremental mileage between the baseline and the option scenarios was extracted). A standard annualisation factor of 335 has been used.

G.6 The changes in annual train hours are annualised from daily hours, which are sourced from MOIRA outputs (i.e. for each timetable modelled in MOIRA, the incremental hours of operation were extracted and then annualised using the same assumption as above).

G.7 The difference in number of train sets/units required to operate the service was established based on the service frequency and journey time of the services.

Unit cost rates

G.8 The timetable inputs described above were then multiplied by unit cost rates for each of the cost elements. Data was sourced from South Eastern Railway, South Western Railway, Network Rail and HS1 Ltd. Detailed costs were not available for International services therefore lease costs for Eurostar rolling stock have been estimated based on Steer experience.

Rolling Stock

G.9 This Rolling Stock lease includes the additional capital and non-capital lease for rolling stock obtained from the TOCs. Costs of lease agreements relating to stock purchase are typically fixed in nominal terms from the commencement of the lease agreement. TAG Unit A5.3 establishes the approach to forecast rolling stock lease costs beyond the initial lease period. This approach has been followed to forecast lease costs.

G.10 The analysis assumes that rolling stock lease costs remain constant in nominal terms until 2044/45[47] and new lease costs for subsequent leases follow a 35-year cycle until the end of the appraisal period, with the lease costs for each new period following the approach described in TAG.

G.11 The maintenance cost category includes all maintenance and labour costs for each rolling stock and is benchmarked against Steer's knowledge of rolling stock maintenance costs.

Staff Costs

G.12 The staff costs per hour used in the calculation can be found in Table G.4.

[47] Rolling stock was purchased in 2009 and a life of 35 years is assumed.

Table G.4: Staff Cost Unit Cost

Item	Unit	Price Base	Value (£)
Total Train Crew (1 x driver and 1 x guard)	£ per train hour	2019/20	154
Driver	£ per train hour	2019/20	96
On Board Manager	£ per train hour	2019/20	58

Source: Steer

G.13 The staff unit cost was derived by dividing the staff pay, including pension and national insurance contributions, with the productive hours per year, as below:

$$Staff\ Unit\ Cost = \frac{Pay * (1 + Pension\ \&\ NI\ Rate)}{Productive\ Hours}$$

G.14 The South Eastern driver pay was sourced from ASLEF. The SE on-board manager pay is assumed to be 60% of the driver pay. The pension and national insurance contributions rate is assumed to be 25% of basic pay, while the productive hours are set at a standard 750 for both drivers and on-board managers. The train crew analysis assumes one driver and one on-board manager for each train.

Electricity

G.15 This electricity cost per vehicle mile/kilometre is derived by multiplying the consumption per vehicle kilometre by the price per kWh obtained from the operator or from the HS1 traction and non-traction rate summary.

Network Rail Variable Usage Charges

G.16 The Variable Usage Charge (VUC) per vehicle mile for each rolling stock type is obtained by using the CP6 rate obtained from Network Rail. [48]

HS1 Track Access Charges

G.17 The HS1 Track Access Charges are based on the 2021 HS1 Network Statement and are shown in Table G.5. [49]

Table G.5: HS1 Track Access Charges Unit Cost

Item	Unit	Price Base	Value (£)
IRC	£ per train per min	2019/20	96.06
AIRC	£ per train per min	2019/20	0.37
OMRC	£ per train per min	2019/20	45.11

Source: 2021 HS1 Network Statement

G.18 The unit cost per minute is derived by multiplying the cost per train service per minute with the number of minutes spent on each route. The unit costs used to inform this analysis is set out in Table G.6.

[48] Control Period 6 (2019-2024)

[49] 2021 HS1 Network Statement

Table G.6: Track Access Charges – HS1 Unit Costs by service group

Item	Unit	Price Base	Value (£)
IRC - Ashford International Station	£ per train service	2019/20	2,979
IRC - Ebbsfleet International Station (Up direction)	£ per train service	2019/20	1,345
IRC - Ebbsfleet International Station (Down direction)	£ per train service	2019/20	1,441
IRC - Springhead Junction	£ per train service	2019/20	1,586
AIRC - Ashford International Station	£ per train service	2019/20	11
AIRC - Ebbsfleet International Station (Up direction)	£ per train service	2019/20	5
AIRC - Ebbsfleet International Station (Down direction)	£ per train service	2019/20	5
AIRC - Springhead Junction	£ per train service	2019/20	6
OMRC - Ashford International Station	£ per train service	2019/20	1,550
OMRC - Ebbsfleet International Station (Up direction)	£ per train service	2019/20	697
OMRC - Ebbsfleet International Station (Down direction)	£ per train service	2019/20	742
OMRC - Springhead Junction	£ per train service	2019/20	810

Source: 2021 HS1 Network Statement

G.19 The Operation, Maintenance and Renewal Charge (OMRC) covers the maintenance of the infrastructure and, as such, is comprised of a fixed and a variable element. The analysis assumes that the entire OMRC rate per minute would be charged to all additional train services, whereas in reality OMRC costs might need to be revisited to reflect substantial changes in the service levels.

Station Access Charges

G.20 HS1 Station Access for consist of:

- Station Long Term Charge (LTC) – it is a fixed charge to recover repair and renewal costs at the HS1 stations. It is allocated to operators based on the number of train departures and the relative size of the areas of the station used by each operator
- Station qualifying expenditure (QX): is a charge to recover operating and maintenance costs at the HS1 stations. Costs are estimated by each station operator and agreed with

the TOCs using the station. There is a washup every 6 months to reflect the difference between estimated and actual costs. Each station cost is allocated to TOCs based on the number of train departures and relative area of the station used.

Table G.7: Station Access Charges – HS1 Unit Costs by service group

Item	Price Base	Value 2019/20 (£m)
Station Long Term Charge (LTC)	2019/20	9
Station qualifying expenditure (QX)	2019/20	32

Source: 2021 HS1 Network Statement

G.21 The station access charges for domestic high-speed services has been removed from the Counterfactual. This has been estimated by proportioning the total LTC and QX cost income by the number of daily South Eastern vehicles operating on HS1 compared against the Eurostar number of vehicles.

G.22 In the Counterfactual scenario the Station Access charges for International services are assumed to transfer to the classic network at a similar magnitude.

G.23 The impact of other service changes to domestic South Eastern and South Western services on conventional network Station Access charges is assumed to be minimal and has therefore not been modelled.

H TAG appraisal tables

Table H.1: Economic Efficiency of the Transport System (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	823,749		69,533		754,216	
Vehicle operating costs						
User charges	-513,925				-513,925	
Maintenance						
BENEFITS: COMMUTING	309,824	*(1a)*	69,533	-	240,292	-

Non-business: Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	1,337,760		69,533		1,268,227	
Vehicle operating costs						
User charges	-85,582				-85,582	
Maintenance						
BENEFITS: OTHER	1,252,178	*(1b)*	69,533	-	1,182,645	-

Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	3,363,133			-			3,363,133	
Vehicle operating costs								
User charges	-222,933						-222,933	
Maintenance								
Subtotal	3,140,200	*(2)*	-	-	-	-	3,140,200	-
Private sector provider impa						**Freight**	**Passengers**	
Revenue	6,884,557						6,884,557	
Operating costs	-1,523,041						-1,523,041	
Investment costs								
Grant/subsidy								
Subtotal	5,361,515	*(3)*					5,361,515	
Other business impacts								
Developer contributions		*(4)*						
NET BUSINESS IMPACT	8,501,716	*(5) = (2) + (3) + (4)*						

TOTAL		
Economic Efficiency Benefits	10,063,718	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

Table H.2: Public Accounts (PA) Table

			ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue	0					
Operating Costs	0					
Investment Costs	0					
Developer and Other Contributions	0					
Grant/Subsidy Payments	0			0	0	0
NET IMPACT	**0**	*(7)*	0	0	0	0
Central Government Funding: Transport						
Revenue	-2,285,707				-2,285,707	
Operating Costs	5,040,445				5,040,445	
Investment Costs	10,749,338				10,749,338	
Developer and Other Contributions	0					
Grant/Subsidy Payments	0					
NET IMPACT	**13,504,077**	*(8)*	0	0	13,504,077	0
Central Government Funding: Non-Transport						
Indirect Tax Revenues	1,471,514	*(9)*	7,354		1,464,160	
TOTAL						
Broad Transport Budget	**13,504,077**	*(10) = (7) + (8)*				
Wider Public Finances	**1,471,514**	*=(11) = (9)*				

Table H.3: Analysis of Monetised Costs and Benefits

Noise	417	*(12)*
Local Air Quality	1,419	*(13)*
Greenhouse Gases	7,424	*(14)*
Infrastructure	313	*(15)*
Physical Activity		*(16)*
Accidents	5,728	*(17)*
Economic Efficiency: Consumer Users (Commuting)	309,824	*(1a)*
Economic Efficiency: Consumer Users (Other)	1,252,178	*(1b)*
Economic Efficiency: Business Users and Providers	8,501,716	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-1,471,514	*- (11) - sign changed from PA table, as PA table*
Present Value of Benefits (see notes) (PVB)	8,607,504	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	13,504,077	*(10)*
Present Value of Costs (see notes) (PVC)	13,504,077	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	-4,896,573	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	0.64	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

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