Economic Impact Assessment

Autumn 2021

Economic impact of the northern runway project

Prepared for
Gatwick Airport Ltd

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Contents

Boxes, figures and tables

Glossary

Term	Definition
Base year	Year used for inflation adjustment and discounting. 2010 for national impacts and 2021 for local impacts.
Baseline	The situation that would arise without the Project. Analogous to the 'do minimum' scenario.
Benefits arising from fare effects	Benefits to passengers arising from only changes in air fares.
Benefits arising from time effects	Benefits to passengers arising from only changes in travel time.
Catalytic footprint	The employment and GVA due to the economic activity of firms choosing to locate or expand near the airport because of the connectivity that it offers.
Catalytic net impact	Catalytic impacts are the increase in employment and GVA when firms choose to expand or locate close to the airport because of the connectivity that is creates. Net catalytic impacts exclude the share of these impacts that is due to resources and people that would already have been working locally otherwise (i.e. in the baseline).
Direct footprint	The employment and GVA associated with the activities on the Gatwick Airport campus. We include both GAL and other firms that operate on site at the airport.
Economic footprint	The economic footprint measures the total resources on and off the airport campus used in delivering the economic activity at Gatwick in GVA or employment numbers: it consists of direct, indirect and catalytic impacts.
Factor values	Values net of indirect taxation.
Fare elasticity of demand	Average percentage change in passenger demand as a response to a 1% change in air fares.
GVA	GVA (gross value added) is a standard measure of economic activity that statistical agencies (such as the Office for National Statistics—ONS, and Eurostat) routinely use to ascertain an industry's contribution to an economy's total output. It is defined as the total value of output from a service excluding the value of any intermediate inputs (i.e. outputs of other sectors used as inputs from the supply chain).
Indirect footprint	The employment and GVA supported throughout the UK via the supply chains of the firms located at Gatwick Airport.
Indirect tax correction factor	The average rate of indirect taxation in the economy.
Job productivity impact	The job productivity impacts are the additional productivity (in GVA) generated by jobs related to airport activities (i.e. the increase in GVA associated with workers switching jobs to work in activities related to the airport as a result of the Project).
Labour supply impact	The labour supply impact is the increase in employment and GVA in the South East in airport-related activities (linked to direct and indirect impacts), above and beyond those that would have arisen anyway in the local area, which are due to the Project and lead to a net increase in employment in the South East.
London aviation system	London City, Gatwick, Heathrow, Luton, Southend, and Stansted airports; airlines operating at these airports; and passengers travelling through these airports.
Market values	Values gross of indirect taxation.
Net economic impact	Net economic impacts reflect the impacts generated above and beyond those that would have arisen anyway had people who are employed at Gatwick been doing something else.
Normal profit	The profit that airlines would make under competitive market conditions.

Optimism bias	Systematic bias for being optimistic on scheme costs and delivery times.
Present value	A value of a stream of impacts (cash or non-cash) discounted to the base year.
Price floor	The minimum average price that airlines would set to offer aviation services.
Providers of aviation services	Airlines and airports.
Real value	An inflation-adjusted value deflated to the base year.
Shadow cost	The value of scarcity, reflected in air fares that are higher than would prevail if there were no capacity constraints.
User surplus	The value of obtaining a service beyond the price that is associated with it.
Provider surplus	The value of delivering a service beyond the cost that is associated with it.
The Project	Gatwick's Northern Runway Project—it proposes alterations to the existing 'standby' or 'northern' runway at Gatwick Airport, which, together with lifting the current restrictions on its use, would enable dual runway operations. The proposed alterations would enable the northern runway to be used for take-off-only operations (i.e. no landings) for smaller aircraft (up to and including Code C aircraft).
Users of aviation services	Existing and potential air passengers and freight shippers.
Wider economic impacts	Impacts of the Project on people and businesses beyond the users and providers of the aviation network.

Source: Oxera.

1 Executive summary

1.1 This report, prepared on behalf of Gatwick Airport Limited (GAL), presents the preliminary findings of an Economic Impact Assessment of Gatwick's Northern Runway Project—a proposal to make the best use of Gatwick's existing runways (referred to as 'the Project'). The Project proposes alterations to the existing 'standby' or 'northern' runway at Gatwick Airport, which, together with lifting the current restrictions on its use, would enable dual runway operations. The proposed alterations would enable the northern runway to be used for take-off-only operations (i.e. no landings) for smaller aircraft (up to and including Code C aircraft).

1.2 In 2020, the COVID-19 pandemic had a significant impact on the aviation sector around the world. Between 2019 and 2020, passenger volumes dropped by 78% at Gatwick Airport. However, according to forecasts produced by ICF for GAL, by the time the Project is expected to be completed in 2029, the effect of the pandemic on the UK aviation sector as a whole, and Gatwick Airport in particular, is expected to have subsided. As a result, our analysis is based on the assumption made by GAL in producing the traffic forecasts that the COVID-19 pandemic will subside and the aviation sector in the UK will return to growth.

1.3 By enabling dual runway operations, the Project would significantly expand capacity at Gatwick Airport and in turn enable additional air traffic to flow through Gatwick Airport and the London aviation system as a whole: the traffic forecasts produced by GAL suggest that the Project would increase passenger volumes at Gatwick Airport by approximately 13m in 2038, compared with the passenger throughput that would exist without the Project, which is the equivalent number of passengers using Birmingham Airport in 2019. The use of this capacity by passengers and airlines would have substantial economic impacts at national, regional and local levels. GAL has commissioned Oxera to undertake an assessment of these economic impacts. In addition, a sensitivity assessment undertaken by Oxera has shown that the scheme would continue to deliver economic benefits even if forecast traffic in the London system were delayed by five years.

1.4 By alleviating the capacity constraints that are forecast to be faced at Gatwick Airport during peak times, the Project would enable airlines to increase service frequencies and reduce air fares by increasing the number of flights that the airport can accommodate. We estimate that the net benefits to passengers, airlines and airports would range between £7.3bn and £14.3bn in 2010 prices and values.[1] In addition, the Project is expected to provide unquantified benefits through:

- increasing competition in the aviation sector;
- increasing the resilience of the airport and the other London airports to unexpected disruptions;
- increasing freight capacity.

1.5 By providing increased connectivity, the Project is also expected to have impacts beyond passengers, airlines and airports. These additional impacts would benefit businesses, provide new job opportunities to individuals, increase productivity by bringing individuals and businesses together, and facilitate increased trade and Foreign Direct Investment (FDI). We estimate the

[1] Present value calculated over 60 years from Project opening in 2029.

benefit of these impacts to be worth £4.7bn to £6.6bn to the UK economy over the 60-year assessment period, with an increase in Air Passenger Duty (APD) revenues to government of £4.7bn in 2010 prices and values.

1.6 Increased activity at the airport would increase noise levels and greenhouse gas (GHG) emissions, and decrease air quality. The social costs of these environmental impacts are estimated to be between £0.9bn and £3.5bn in 2010 prices and values.

1.7 Taking into account scheme costs of £2.7bn, we estimate that the net present value (NPV) of the Project will be in the range of £10.5bn to £22.0bn in 2010 prices and values. This is comparable to the NPV of Crossrail.[2]

1.8 While there are benefits from the Project to the UK from increased connectivity and capacity, there will also be substantial local and regional impacts. The local area[3] can be characterised as having steady population growth over the last decade (before the COVID-19 pandemic), with growth driven mainly by internal and international migration; and employment (unemployment) that is consistently higher (lower) than in the rest of England. Jobseekers in the local area seek jobs largely in sales and customer service. Average earnings are higher among local residents than among local workers, reflecting commuting patterns out of the area. Overall deprivation across multiple criteria is low compared with the rest of England, although there are pockets of deprivation within the local area and housing affordability is a challenge in many parts of the local area.

1.9 The Project is expected to increase employment and value associated with Gatwick Airport by increasing the scale of economic activity on site (known as 'direct' impacts), in the supply chains to those firms (known as 'indirect' impacts), and to firms that locate close to Gatwick Airport because of the business opportunities that it offers ('catalytic' impacts): together, these direct, indirect and catalytic impacts are known as the 'footprint' of Gatwick Airport. While much of this might be displaced from other parts of the UK or other employment within the local area, the impact on the local economy would be significant.

1.10 Overall, in the Gatwick Diamond, the Project would represent an economic footprint of £889m in gross value added (GVA), in 2021 prices, and create 10,900 additional jobs in 2038, including:[4]

- economic activity on site at the airport (direct footprint of £284m GVA and 3,200 jobs);
- economic activity of the supply chain of firms on site (indirect footprint of £118m GVA in 2021 prices and 1,500 jobs);
- economic activity of firms choosing to be located near the airport for the business opportunities that it presents (catalytic footprint of £487m GVA in 2021 prices and 6,200 jobs).

1.11 To put these estimates into context, if we were to convert GVA generated by the Project in the Gatwick Diamond into the equivalent tax take,[5] the Project's

[2] This was quantified at £12.3bn in 2010 prices and values. Oxera (2017), 'Investment in rail: the economic benefits', October.
[3] Specifically, the Gatwick Diamond area and Coast to Capital LEP.
[4] 2021 prices, for the 2038 calendar year only. Compared with the situation without the Project.
[5] Using the ratio of GVA to tax take in the UK as a whole.

value added in the Gatwick Diamond could be compared to the cost of establishing:

- 23,600 primary school places or 17,200 secondary school places;
- 7,400 nursing positions or 5,900 police constable positions.

1.12 The Project would have significant benefits at the national level through its impact on aviation markets and the wider economy. These impacts would be materially larger than the negative impacts that we have quantified, meaning that the Project would have a positive social impact overall.

1.13 At the local level, the Project would have a material economic impact due to the increase in operational activity at the airport, the resulting supply chain activity, and the opportunities created by the connectivity improvements.

2 Summary

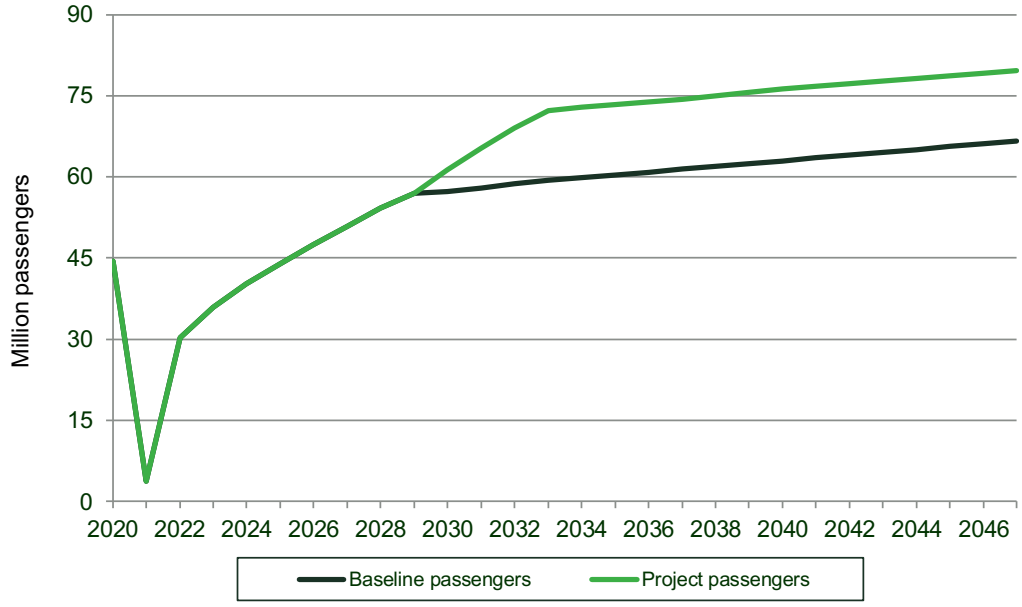
2.1 Gatwick Airport is the UK's second-busiest airport, and has continued to be so even during the COVID-19 pandemic.[6] It is served by a single runway. It also has a further runway, located to the north of the main runway, but a planning restriction currently restricts use of this northern runway to when the main runway is closed. Gatwick Airport Limited (GAL) is proposing to make alterations to the northern runway, which, along with lifting the current restrictions on its use, would enable dual runway operations ('the Project'). The proposed alterations would enable the northern runway to be used for take-off-only operations (i.e. no landings) for smaller aircraft (up to and including Code C aircraft).

2.2 By enabling dual runway operations, the Project would significantly expand capacity at Gatwick Airport and in turn enable additional air traffic to flow through Gatwick and the London aviation system as a whole, as shown in Figure 2.1.[7] GAL has commissioned Oxera to undertake an economic assessment of the Project.[8]

2.3 GAL has provided Oxera with two traffic forecasts, as illustrated in Figure 2.1 below:

- a 'Baseline' forecast where Gatwick Airport remains as a single-runway airport;
- a 'Project' forecast where the Project is completed, meaning that Gatwick Airport brings the northern runway into operation and introduces dual runway operations.

Figure 2.1 Gatwick traffic forecasts



Note: Passenger growth in the Baseline scenario reflects assumptions on improved runway utilisation, increased load factors and plane sizes. Passenger growth with the Project

[6] In 2019, close to 47m passengers travelled through Gatwick, and 10m travelled through Gatwick in 2020. Gatwick is second to Heathrow, which welcomed 81m passengers in 2019 and 22m in 2020 (CAA data).
[7] Consisting of Gatwick, Heathrow, London City, Stansted, Luton, and Southend airports.
[8] This Economic Impact Report is separate from, but informs, the socioeconomic analysis provided at Chapter 16 of the 'Preliminary Environmental Information Report'.

corresponds to the same assumptions as the Baseline and additional air traffic movements (ATMs) from the additional capacity that the Project enables.

Source: GAL.

2.4 Figure 2.1 shows that GAL forecasts that passenger volumes will initially rebound strongly in 2021/22 from the current COVID-19-induced low, before transitioning to a more steady recovery path and reaching 2019/20 levels of traffic in 2024/25 (i.e. approx. 45m passengers). IATA has estimated that global passenger traffic will return to pre-COVID-19 levels in 2024, which is in line with these forecasts for Gatwick.[9]

2.5 By the time the Project is completed in 2029, the effect of the pandemic on the UK aviation sector as a whole, and Gatwick Airport in particular, is expected by GAL to have fully subsided. As a result, our analysis is based on the assumption that the COVID-19 pandemic will have a limited influence on the Project in the long run.

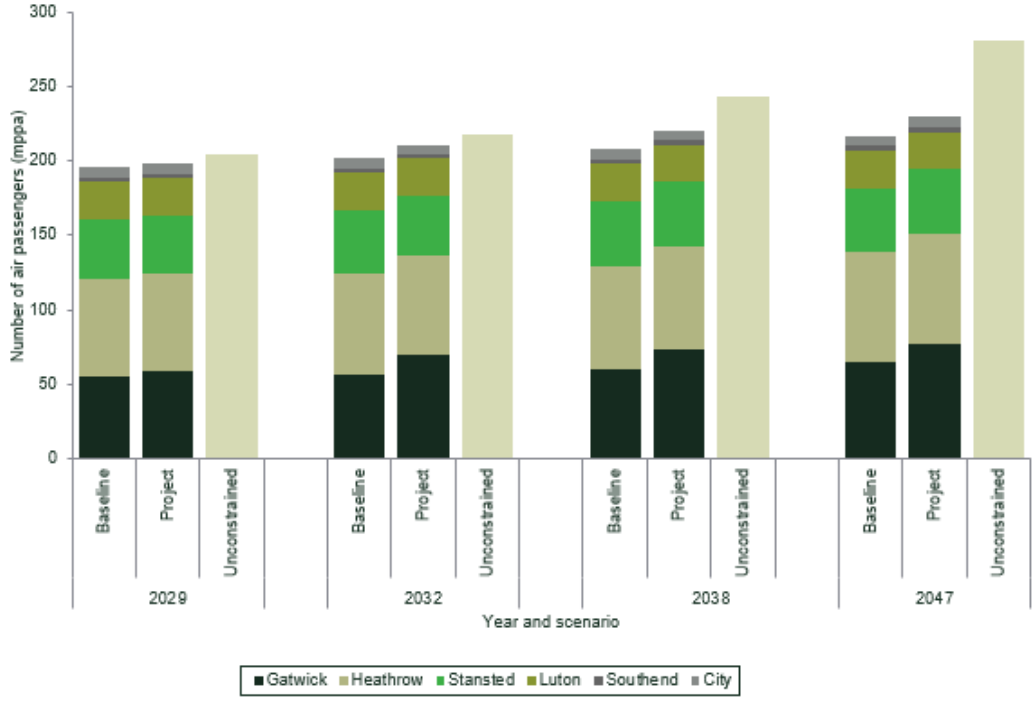
2.6 Without the Project, the passenger volumes at Gatwick Airport in the 'Baseline' scenario are forecast to continue to grow, with passenger volumes forecast to exceed 62m passengers per annum (mppa) by 2038, and reach 67mppa in 2047. Under the Project scenario, passenger volumes are forecast to increase rapidly following the completion of the Project and the introduction of dual runway operations in 2029. There would then be further growth to serve 76mppa in 2038, and 80mppa in 2047.

2.7 The incremental growth in air traffic resulting from the Project is projected to be similar to the level of passenger traffic at Birmingham Airport in 2019.[10] This increase in passenger volumes would generate important economic benefits across the local, regional and national economies. A sensitivity assessment undertaken by Oxera has shown that the scheme would continue to deliver economic benefits even if forecast traffic in the London system were delayed by five years.

2.8 ICF, which has overseen the preparation of the forecasts, has provided us with forecasts for the London aviation system.[11] These London-level forecasts cover three scenarios for passenger numbers in the years 2029, 2032, 2038, and 2047.[12] These are illustrated in Figure 2.2 below. The scenarios show the evolution of demand across the London aviation system with and without the Project (corresponding to the 'Baseline' and 'Project' scenarios in Figure 2.1 above). ICF has also provided a scenario showing unconstrained demand for air travel in the London aviation system—that is, the level of demand that would be seen if there were no capacity constraints at the London airports. We can see from the forecasts that the level of unconstrained demand increases over time from 204m passengers in 2029 to 243m in 2038 and to 280m in 2047.

[9] IATA (2020), 'Recovery Delayed as International Travel Remains Locked Down', 28 July.
[10] Source: CAA Airport Data 2019.
[11] Gatwick Airport forms part of a wider system of airports in London and the surrounding area. We would therefore expect the Project's national impact to be on passengers and businesses using London airports more generally, and we evaluate the impacts of this expansion on users and providers of aviation services within the London aviation system. The airports in the London aviation system are City, Gatwick, Heathrow, Luton, Southend, and Stansted airports.
[12] We interpolate linearly values for the years in between and assume that passenger numbers after 2047 are constant.

Figure 2.2 Aviation forecasts for the London system



Note: Values are forecasts of passenger numbers in the London aviation system for all scenarios. International-to-international transfer passengers are excluded from passenger numbers.

Source: ICF.

2A National impact of the Project

2.9 Our analysis shows that the Project will offer very significant economic benefits to the local and regional areas around Gatwick Airport. From a national perspective, the impacts of the Project will arise through the creation of additional aviation capacity.[13]

2.10 Increasing capacity at an airport generates a variety of effects that provide benefits and losses to passengers, airlines, and the airport. As additional capacity becomes available, airlines will use this capacity to compete with each other for passengers and freight, leading to:

- a reduction in fares for passengers;
- increased route frequencies;
- an increase in passenger numbers resulting from lower fares and higher frequencies;
- airlines potentially losing out due to reduced fares relative to the situation that would have arisen without the Project (as the fares that can be charged when there is a shortage of capacity will be above the competitive level),[14] which is partly offset by increased passenger numbers;

[13] This is consistent with the Department for Transport's (DfT) approach to assessing transport schemes, set out in WebTAG.
[14] This does not mean that airlines will not be profitable: airlines will continue to make sustainable levels of profit. The comparison is with the situation that would have arisen without the Project: airline losses due to reduced fares are benefits to passengers as passengers will benefit from travelling at lower prices.

- an increase in airport revenues as a result of an increase in the number of passengers and frequencies.

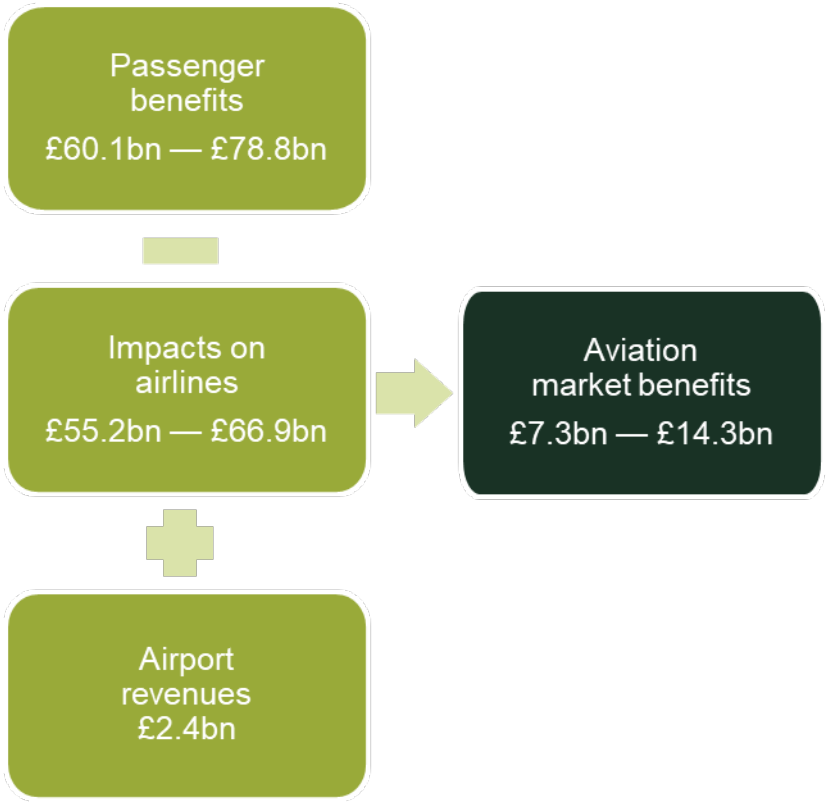
2.11 There will also be costs arising from the Project. The Project requires a capital investment on and around the Gatwick Airport site, which will be met by GAL. In addition, there will be ongoing operating costs to GAL and airlines resulting from increases in air travel.

2.12 We have calculated the benefits and costs resulting from the Project for various assumptions concerning minimum air fares that cover airlines' costs. In our analysis, we have considered:

- users and providers of aviation services in the London aviation system;
- a time horizon of 60 years after the Project is completed and dual runway operations commence, in addition to the costs incurred during the Project's development, which is in line with government assessment guidance and reflects the longevity of this investment.

2.13 We have calculated that the net national economic benefit (i.e. the difference between the Baseline—where the Project is not undertaken—and the situation with the Project) to the aviation system would range from £7.3bn to £14.3bn in 2010 prices and values. This shown in Figure 2.3 below.

Figure 2.3 Total benefits to passengers and providers in the London aviation system (£bn)



Note: All estimates are in 2010 prices and values. 'Benefits' represent benefits at various assumptions used in the estimation of fares as described in section 4. Higher changes in passenger benefits are associated with higher changes in airline revenues. In total, this is estimated to result in a positive impact on the UK aviation market in all scenarios.

Source: Oxera.

2.14 In addition, the expansion of airport capacity would have other effects, including on competition between airlines and airports, on the resilience of the airport and the London aviation system, and on the freight market.

Competition

2.15 Capacity constraints influence the level of competition between airports. The additional capacity with the Project would relax the capacity constraints at Gatwick Airport, enabling Gatwick Airport to provide a stronger competitive constraint on other airports in the London market—both for airline location and for passengers. Competition could be encouraged both through new airlines operating at Gatwick Airport using the new capacity, or existing airlines expanding their existing operations by offering a wider range of flights.

Resilience

2.16 The resilience of an aviation system refers to the system's ability to continue its daily activities as scheduled despite disruptions. A lack of resilience causes system-wide delays and cancellations through knock-on effects, increases journey time variability, and increases the number and extent of delays, which decreases the reliability of air travel.

2.17 After its construction, the Project could increase resilience at Gatwick Airport and the London aviation system by reducing delays caused by day-to-day unexpected events and major disruptions.[15]

Freight

2.18 Gatwick Airport provides an important source of air freight capacity to the UK—in 2019 the airport handled 150,000 tonnes of air freight.[16] The Project would help to facilitate an increase in air freight at Gatwick Airport by increasing the number of ATMs and thereby increasing both the frequency and range of destinations served. With the Project, air freight traffic is expected to increase by 10% in the Project's opening year, and by 27% and 20% in 2038/39 and 2047/48 respectively as a result of the Project.[17]

2A.1 Wider economic impacts

2.19 The effects of airport capacity that extend beyond passengers, airlines and airports are known as wider economic impacts. They include:[18]

- induced investments where the reduced costs of doing business brought about by the transport scheme lead to investment in the surrounding area;
- employment effects stemming from the improvements in access to more productive jobs;
- productivity impacts arising from the increase in employment density, which creates agglomeration effects.

2.20 We estimate these to be worth £4.7bn to £6.6bn to the UK economy in 2010 prices and values over the 60-year assessment period.

[15] Resilience during the construction phase of the Project would be lower. This reduction is because the northern runway will not provide any capacity in the event of disruption during construction.
[16] Gatwick Airport Limited data (2020).
[17] Source: ICF forecasts.
[18] Department for Transport (2018), 'TAG Unit A2.1 Wider Economic Impacts Appraisal', May.

2.21 In addition to these effects through non-transport markets, the Project would generate additional government revenue through increased Air Passenger Duty. We estimate this to be £4.7bn in 2010 prices and values.[19]

2.22 Combined with the benefits to passengers and airport revenues, we calculate the quantified national benefits arising from the Project at £72.0bn to £92.5bn in 2010 prices and values. Table 2.1 below illustrates the breakdown of these benefits.

Table 2.1 Total benefits of the Project (£bn)

Total benefits to users and providers	62.5 – 81.2
• Passenger benefits	60.1 – 78.8
• Change in airport revenues	2.4
Wider economic benefits	**4.7 – 6.6**
• Output change in imperfectly competitive markets	4 – 5.8
• Marginal external costs	-0.0
• Move to more or less productive jobs	0.1
• Agglomeration benefits	0.7
Government revenues	**4.7**
Present value of benefits to passengers, producers and the wider economy	**72.0 – 92.5**

Note: All estimates are in 2010 prices and values. They may not sum due to rounding. Ranges represent different assumptions on the minimum prices that airlines would offer.

Source: Oxera.

2A.2 Environmental impact

2.23 Increased air and ground traffic with the Project would result in environmental costs to UK society. We have estimated the present values of these costs by monetising changes in noise, air quality, and GHG emissions with the Project at £0.9bn to £3.5bn in 2010 prices and values. Table 2.2 below illustrates a breakdown of these costs into their components.

Table 2.2 Present value of monetised environmental impacts of the Project (£bn)

Noise	**0.0**
Air quality	0.0 – 0.4
GHG	0.9 – 3.1
Total	**0.9 – 3.5**

Source: Oxera.

2A.3 Conclusions on national economic impact

2.24 The overall national benefits and costs of the Project are summarised in the table below. Our analysis suggests that the Project would result in an overall social benefit of £13.3bn to £24.7bn in 2010 prices and values.

[19] Our analysis includes new APD rates from 2022. We assume no changes to the APD rates. For more details, see HM Revenue & Customs (2021), 'Rates for Air Passenger Duty', https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty, accessed 3 May 2021.

Table 2.3 Net social benefits of the Project (£bn)

	Estimated value
Benefits to passengers, producers and the wider economy*	**72.0 – 92.5**
Welfare transfers from airlines to passengers*	**-55.2 – -66.9**
Environmental costs+	**-0.9 – -3.5**
• Noise impacts	0.0
• Air quality impacts	**0.0–0.4**
• GHG emissions	**-0.9 – -3.1**
Present value of net social benefits	**13.3 – 24.7**

Note: All estimates are in 2010 prices and values. They may not sum due to rounding. (*) Ranges reflect benefits calculated at various assumptions used to estimate minimum prices that airlines may set to offer aviation services to passengers in the future with and without the Project. This is explained in detail in section 4F. (+) Ranges in environmental costs represent uncertainty in the monetary costs associated with air quality and GHG emissions. Ranges for the present value of net social benefits reflect the minimum and maximum benefits that the project may generate: the lower bound includes the lowest benefits and the higher environmental costs, and the upper bound includes the highest benefits and lowest environmental costs.

Source: Oxera.

2.25 Taking into account scheme costs of £2.7bn, we estimate that the NPV of the Project will be in the range of £10.5bn to £22.0bn in 2010 prices and values.[20]

2B Local economic context

2.26 The Project is likely to have a significant economic effect on the surrounding area, both on the Gatwick Airport site and across the local and regional economies. As such, it is important to consider the existing economic conditions in the area surrounding Gatwick Airport, thus putting the impact of the Project into context.

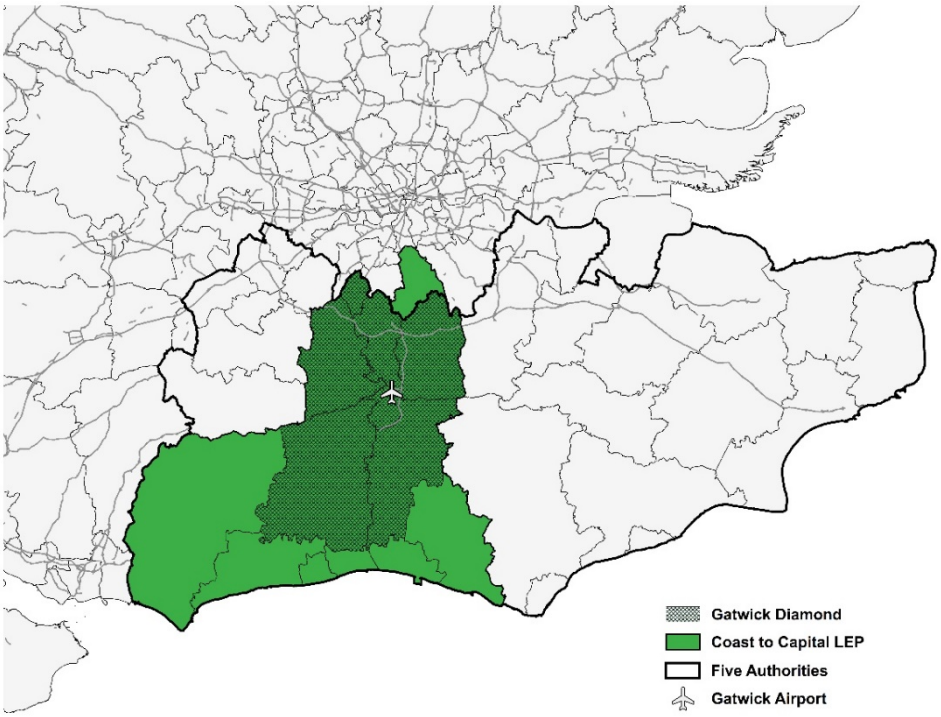
2.27 By the time the Project opens in 2029, the effect of the COVID-19 pandemic on the UK aviation sector as a whole, and Gatwick Airport in particular, is expected by GAL to have subsided. Therefore, we have not used 2020 as the baseline for local and regional economic conditions that may be prevalent when the Project is completed, as the economic conditions in 2020 are likely to have been significantly affected by the COVID-19 pandemic. We therefore report impact estimates and statistics on the local socioeconomic conditions in 2019 and provide indications on the potential impact of the pandemic looking forward. There are significant uncertainties arising from the long-term impacts of the COVID-19 pandemic and the UK's exit from the EU for the structure of the economy and the geographical distribution of employees arising from future migration policy and remote working, but it is too early to understand the impact of these changes.

2.28 For the local and regional economic assessment, we have considered three areas around the Gatwick Airport site: the Gatwick Diamond area, the Coast to Capital Local Enterprise Partnership (LEP) area, and the 'Five Authorities' area.[21] These areas are illustrated in the figure below and described in the text

[20] This is comparable to the NPV of Crossrail at £12.3bn in 2010 prices and values. Oxera (2017), 'Investment in rail: the economic benefits', October.
[21] We consider the scale of Gatwick's economic significance in the wider sub-regional area, the Five Authorities Area, which represents the five counties around the airport in South East England: West Sussex, East Sussex, Surrey, Kent, and Brighton and Hove.

below,[22] and are consistent with the areas modelled under the Gatwick Airport Master Plan.[23]

Figure 2.4 Map of local and regional study areas



Note: The Gatwick Diamond and Coast to Capital LEP both represent existing, defined geographies surrounding the airport. The Five Authorities area is made up of five local and unitary authorities surrounding Gatwick Airport: West Sussex, East Sussex, Surrey, Kent, and Brighton and Hove.

Source: Oxera.

Overview of the economic context

2.29 The economic data suggests that the economy around Gatwick Airport has been performing relatively well when compared with the rest of England during the pre-pandemic period. This has been particularly true of the Gatwick Diamond and the Coast to Capital LEP; the Five Authorities area is more diverse (which is consistent with the larger area covered).

2.30 That said, there are areas of opportunity where the Project could be a catalyst for development and improved economic performance, including:

- particular areas of higher deprivation such as Crawley, Croydon, and Brighton and Hove—all of which are well connected to Gatwick;[24]
- specific groups of the workforce where unemployment is higher, such as sales and customer service workers—job types that are well matched to a number of job opportunities at Gatwick.

[22] Comprising West Sussex, East Sussex, Surrey and Kent county councils, and the unitary authority of Brighton and Hove.
[23] Gatwick Airport (2019), 'Gatwick Airport Master Plan 2019', p. 111.
[24] Gatwick Airport (2019), 'Employment, Training and Business Support Strategy', January.

2C Local and regional impact of the Project

2.31 The Project will have economic impacts on the local and regional areas by creating jobs on site at Gatwick Airport (known as direct employment), supporting economic activity through supply chains (known as indirect employment), and attracting businesses into the area to exploit the business opportunities that the Project will offer (known as catalytic employment). It will also have broader impacts on the labour market by increasing productivity and expanding the labour supply.

2.32 We have looked at three ways of assessing the local economic impacts of the Project:

- the 'size' or quantity of resources on and off site used to deliver the economic activity at Gatwick—we refer to this as the **economic footprint**;
- the economic benefits delivered by economic activity at the Project above and beyond those that would have occurred anyway (i.e. in the Baseline)—we refer to this as the **net economic impact**;
- the benefits received from the Project above and beyond those that users (passengers and Gatwick employees) would have received (for example, from other airports)—we refer to this as the **net welfare impact**.

2.33 The three metrics described above provide different perspectives on the impact of the airport on the surrounding area. As such, it is worth noting that these three effects would not be strictly additive to one another—i.e. they should not be added together.

2C.1 Economic footprint

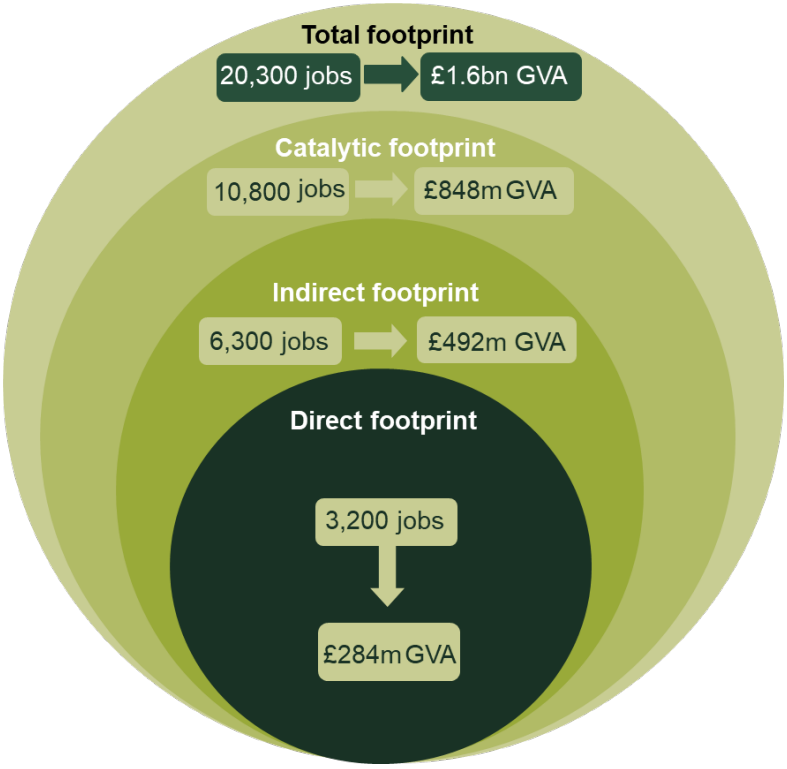
2.34 The **economic footprint** measures the total economic activity associated with the Project, usually through GVA or employment.[25] It is useful to measure the Project's footprint to identify its scale. However, the economic footprint does not consider what those people working at Gatwick or in its supply chain would have done if the Project had not gone ahead. It consists of the following.

- The direct footprint measures the economic activity of businesses located on the Gatwick Airport site. The jobs created on site will primarily service the increase in air traffic facilitated by the Project. The majority of the employment will therefore consist of low- and medium-skill occupation levels such as air cabin crew, maintenance, security and customs. However, there will also be an increase in pilots and flight operations staff and airline/airport management.
- The indirect footprint reflects activity in the supply chains of the firms located at Gatwick Airport. An increase in activity at the airport will require additional inputs from the supply chains of businesses at the airport, stimulating activity elsewhere. This activity will be more dispersed, but much of it will remain in the local/regional area.
- The catalytic footprint represents the activity of firms relocating to the area or expanding in order to take advantage of the enhanced business opportunities offered by the airport following its expansion.

[25] GVA is a standard measure of economic activity that statistical agencies (such as the ONS and Eurostat) routinely use to ascertain an industry's contribution to an economy's total output. It is defined as the total value of output from a service excluding the value of any intermediate inputs (i.e. outputs of other sectors used as inputs from the supply chain).

2.35 Our estimates suggest that the incremental economic footprint of the Project in the UK will be £1.6bn of GVA in 2021 prices and 20,300 jobs in 2038. More than half of this would occur within the Gatwick Diamond, with the vast majority being split across the Coast to Capital LEP and the Five Authorities area. The total economic footprint of the Project is shown in Figure 2.5.

Figure 2.5 Total (UK-wide) economic footprint of the Project in 2038



Note: These values correspond to 2038 estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount rather than full-time equivalents (FTEs). Direct footprint impacts occur on site at Gatwick Airport (i.e. within the Gatwick Diamond). The indirect footprint corresponds to the supply-chain footprint of the Project in the UK as a whole. The catalytic footprint occurs in the vicinity of the airport (i.e. in the Five Authorities area).

Source: Oxera analysis.

2.36 The three measures of economic footprint outlined above represent enduring activities associated with the operation of the Project.

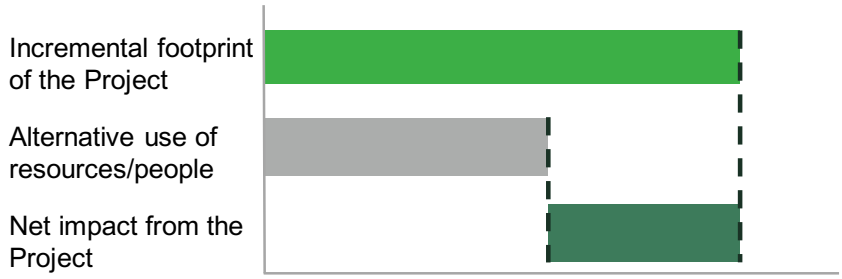
2.37 The Project will also create a temporary requirement for workers between 2024 and 2038 during the construction phases. On the basis of the preliminary construction plans, there would be a peak in construction workforce at around 1,300 workers in 2026. This peak will be short in duration with, on average, 800 construction workers on site during the initial phase of construction (2024 to 2029) and an average of 450 over all phases of construction (2024 to 2038).

2C.2 Net economic impacts on the local area

2.38 The economic footprint measures the total activity associated with the Project. However, if the Project did not take place then most of the people who make up the economic footprint would be employed in other parts of the economy. For example, a job created at the airport may be taken by a person who would otherwise be in employment somewhere else or who would gain employment somewhere else in the local area (or, indeed, elsewhere in the UK). Therefore, we have an alternative perspective on the economic impacts of the Project that

accounts for this: the **net economic impacts**. These reflect the impacts generated above and beyond those that would have arisen anyway had people employed at Gatwick been doing something else. This concept is presented visually in Figure 2.6.

Figure 2.6 Illustration of net economic impact



Note: The incremental footprint of the Project corresponds to the difference between the footprint of the airport with and without the Project.

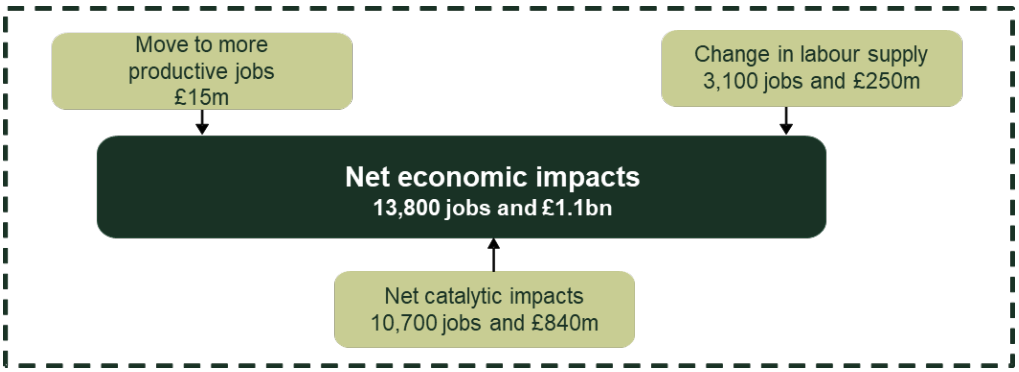
Source: Oxera.

2.39 We have quantified the following net economic impacts of the Project on the local area:

- changes in the labour supply—i.e. more people are economically active than would otherwise have been the case;
- people are more productive in their jobs than would otherwise have been the case (for example, if jobs at the airport or in its supply chain are more productive than the roles that would otherwise be available to people);
- catalytic impacts that account for any loss of economic activity located elsewhere in the area.

2.40 Our estimates suggest that the net impact of the Project increases from 4,500 jobs and £310m of GVA generated in 2029 to 13,800 jobs and £1.1bn in GVA in 2038, in 2021 prices. The majority of these net economic impacts will be located in the Gatwick Diamond area, where GVA would increase by some £632m in 2021 prices as a result of the Project, with a further £426m of GVA in 2021 prices located in the wider Coast to Capital LEP. This net impact of the Project is shown in Figure 2.7.

Figure 2.7 Net local economic impacts (2038 estimates)



Note: Figures relate to the Five Authorities area. Comparisons with other firms are with those firms' direct employment only, to inform the scale of impacts. Estimates are reported in 2021 prices. Employment figures are expressed as headcount rather than FTE.

Source: Oxera.

2C.3 Welfare impacts

2.41 The net economic impacts focus purely on the economic activity generated by the Project. However, there are effects that accrue to passengers in terms of the ease and cost of accessing air travel, and to employees of Gatwick in accessing employment, that are not captured in employment or GVA. These are called **welfare effects**. One example of these is if employees spend less time travelling to work than would otherwise be the case.

Work to quantify this effect is underway. It is the intention to provide further information on this aspect in the final Economic Impact Report submitted in support of the DCO application.

2C.4 Conclusions on local impacts of the Project

2.42 Based on our analysis, we conclude that the economic footprint of the Project would be significant: we estimate that, across the UK, it would generate £1.6bn of GVA in 2021 prices and 20,300 jobs through direct, indirect and catalytic effects in 2038.

2.43 The economic footprint measures the total activity associated with the Project. If the Project did not take place then most of the people who make up the economic footprint would be employed in less productive or less attractive jobs in other parts of the economy. However, even allowing for this, our estimates suggest that the Project would result in a net increase of 13,800 jobs and £1.1bn in GVA in 2021 prices across the Five Authorities area in 2038.

2.44 We summarise the incremental economic footprint and net impact of the Project in Table 2.4 and Table 2.5 below.

Table 2.4 The Project's incremental economic footprints over the base scenario (GVA and employment)

	2029	2032	2038	2047
GVA (£m)				
Direct footprint	75	249	284	324
Indirect footprint	130	431	492	563
Catalytic footprint	260	820	848	918
Total footprint	**465**	**1,501**	**1,624**	**1,805**
Employment				
Direct footprint	1,000	3,100	3,200	3,100
Indirect footprint	1,900	6,100	6,300	6,000
Catalytic footprint	3,800	11,600	10,800	9,900
Total footprint	**6,800**	**20,800**	**20,300**	**19,000**

Note: Entries correspond to the difference between the Project estimates and Baseline estimates each year, after the reallocation of resources and people is accounted for. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

Table 2.5 The Project's net economic impacts as value over the base scenario (GVA and employment)

	2029	2032	2038	2047
GVA (£m)				
Labour supply impact	66	220	250	286
Job productivity impact	4	13	15	17
Catalytic net impact	240	781	840	929
Total net impact	**310**	**1,014**	**1,105**	**1,233**
Employment				
Labour supply impact	900	3,000	3,100	3,000
Catalytic net impact	3,500	11,000	10,700	10,000
Total net impact	**4,500**	**14,000**	**13,800**	**12,900**

Note: Entries correspond to the difference between the Project estimates and Baseline estimates each year, after the reallocation of resources and people is accounted for. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

3 Introduction

3.1 Aviation plays an important role in the UK economy. By enabling the movement of people and goods internationally, air travel facilitates trade, investment, and business activity as well as tourism and leisure activity. The role of aviation in connecting the UK to the global economy is reflected in the growth of the sector: between 2000 and 2019, the number of passengers at UK airports increased by 66%.[26]

3.2 In 2020, the COVID-19 pandemic had a significant impact on the aviation sector around the world. Between 2019 and 2020, passenger volumes dropped by 78% at Gatwick Airport.[27] However, by the time the Project is proposed to open in 2029, GAL expects that the effect of the pandemic on the UK aviation sector as a whole, and Gatwick Airport in particular, is expected to have fully subsided. As a result, our analysis is based on the assumption made by Gatwick Airport Limited (GAL) in producing the traffic forecasts that the COVID-19 pandemic will have a limited influence on the Project in the long run.

3.3 Gatwick Airport has two existing runways—a main runway and a northern runway (which was designed for, and is currently restricted to use as, an emergency/standby runway). GAL has commissioned Oxera to undertake an economic assessment of its proposed project to make alterations to the northern runway, which, along with lifting the current restrictions on its use, would enable dual runway operations ('the Project').

3.4 In particular, the Project would allow:

- arrivals to use the existing main runway;
- shared departures between the existing main runway and the northern runway.

3A Scope of the economic assessment

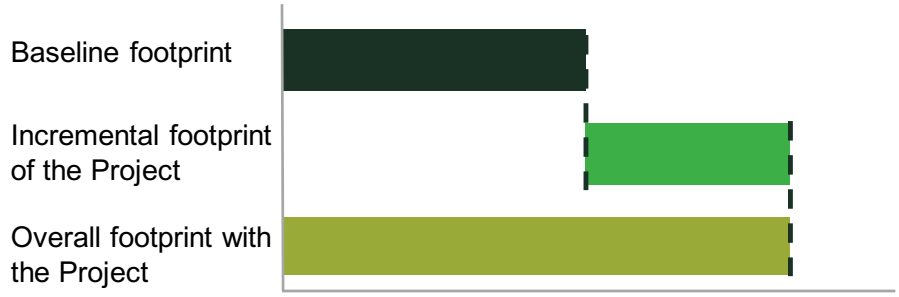
3.5 We have assessed the economic impact of the Project from several perspectives. In particular, we have estimated the net impacts and gross 'footprint' impacts of the Project.

3.6 Gross economic impacts (made up of direct, indirect and gross catalytic impacts—together, the 'footprint') are measures of the total degree of economic activity whether on or off site that is associated with an economic entity such as Gatwick or an identifiable change such as the Project. They include measures such as the total number of workers employed at Gatwick and the economic output generated (measured as GVA). The 'footprint' of a scheme provides useful insight into the scale of the economic activity supported by a project.

3.7 Figure 3.1 below shows how we estimate the incremental footprint of the Project as the gross economic impacts generated by the Project in addition to the impact that would have occurred under the Baseline scenario.

[26] Department for Transport (2020), 'Air traffic, United Kingdom airports', AVI0101.
[27] Gatwick Airport (2020), 'Gatwick Key Facts', https://www.gatwickairport.com/business-community/about-gatwick/company-information/gatwick-key-facts/, accessed 14 April 2021.

Figure 3.1 Illustration of the incremental footprint of the Project



Note: The incremental footprint of the Project corresponds to the difference between the footprint of the airport with and without the Project.

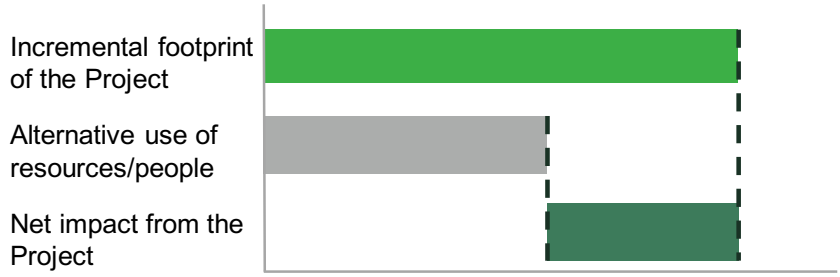
Source: Oxera.

3.8 These footprint measures are 'gross impacts' in that they do not account for the fact that some of the workers who will be employed at Gatwick and in its supply chain following completion of the Project could find other employment instead.

3.9 However, our analysis of net impacts allows that some of the employment could be drawn from people joining the labour force (such as economically inactive individuals). These effects on the labour force would be additional at a national level—i.e. the workers might not be economically active without the Project. Gatwick Airport's Outline Employment Skills and Business Strategy (OESBS) report covers working in association with employment brokers, providing early careers options, and supporting returners to the labour market. These proposed measures could therefore attract some people who are unemployed or economically inactive.

3.10 Net impacts capture the extent to which an area is better (or worse) off owing to the presence of a project, measured against a counterfactual where the project does not occur. In this way, offsetting effects (such as the displacement of workers from one employer to another within a given area) are discounted, and the focus of the assessment is on impacts that can be considered 'additional' to the project. This approach is in line with government guidance on appraisals—in particular, HM Treasury's Green Book[28] and the Department for Transport's (DfT) Transport Analysis Guidance (TAG).[29] How these concepts relate to each other is illustrated in the figure below.

Figure 3.2 Illustration of net economic impact



Note: The incremental footprint of the Project corresponds to the difference between the footprint of the airport with and without the Project.

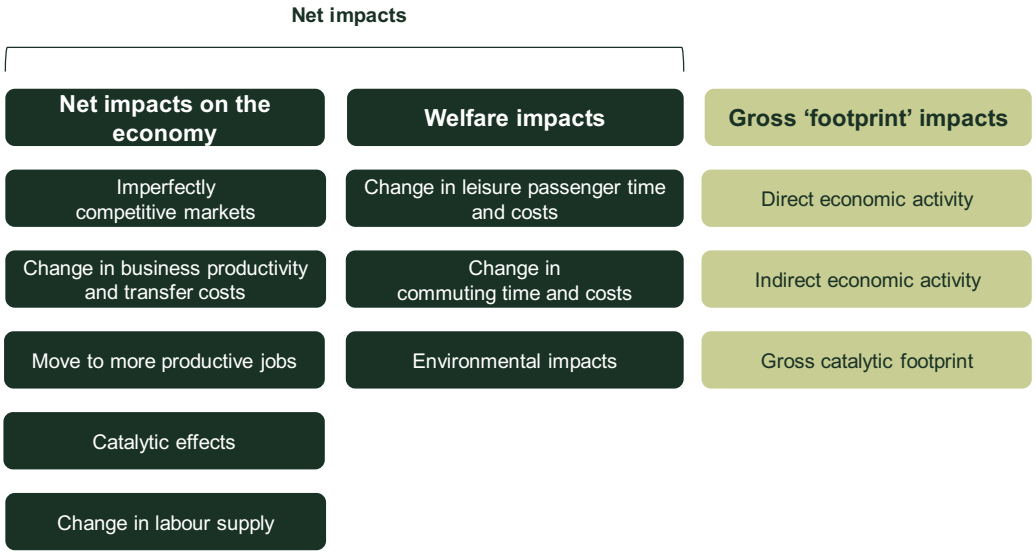
Source: Oxera.

[28] HM Treasury (2018), 'The Green Book: Central Government Guidance on Appraisal and Evaluation'.
[29] Department for Transport, TAG, https://www.gov.uk/guidance/transport-analysis-guidance-webtag

3.11 A further relevant distinction for our analysis is between net impacts on the economy and welfare impacts. While both are considered as part of an economic appraisal (and, indeed, both can be expressed in monetary terms), the former raise national or local GVA directly, while the latter reflects impacts on both economic metrics such as GVA and environmental and social ones.[30]

Figure 3.3 summarises the impacts that we have quantified in this analysis.

Figure 3.3 Summary of gross and net impacts covered in this report



Note: Quantification of the welfare impacts has not yet been completed, but it is intended that further information on this aspect will be provided in the final Economic Impact Report submitted in support of the DCO application.

Source: Oxera.

3B Policy context

3.12 In 2011, the UK government commenced the process of preparing a new policy framework for UK aviation to replace the 2003 Future of Air Transport White Paper—a national aviation policy that had set out a strategic framework for the development of airport capacity, supporting the development of new runways at Heathrow and Stansted and making the best use of other existing airport capacity.

3.13 This led to a draft Aviation Policy Framework being published in July 2012[31] and the final Aviation Policy Framework in March 2013.[32] The Aviation Policy Framework sets out the government's objectives and principles to guide plans and decisions on airport development at the local and regional level.

3.14 It recognises that the aviation sector contributes significantly to the UK economy. However, it also notes that airports in the south east of England (including Heathrow and Gatwick) face capacity challenges. It identifies a number of other challenges in the aviation sector, noting that aviation needs to grow, delivering benefits essential to economic wellbeing while respecting the environment and protecting quality of life.

[30] Welfare impacts include aspects that affect social welfare, but not economic metrics such as GVA. For example, the value of carbon emissions is not captured in traditional economic measures such as GVA, but does affect social welfare and so is captured within a welfare-based appraisal.
[31] Department for Transport (2012), 'Draft Aviation Policy Framework', July.
[32] Department for Transport (2013), 'Aviation Policy Framework', March.

3.15 The Framework confirms the government's support for making best use of existing airport capacity to improve performance, resilience and the passenger experience in the short term.

3.16 Alongside preparing the Aviation Policy Framework, the government also established the Airports Commission, which was asked to consider options for expanding capacity in the London aviation system. The Airports Commission recommended that the capacity challenge could be best met by the construction of a new runway at Heathrow Airport and making best use of existing infrastructure at other airports.[33]

3B.1 Airports National Policy Statement (2018)

3.17 The Airports National Policy Statement (NPS)[34] was designated on 26 June 2018 and set out the primary policy for decision-making in relation to the proposed new runway at Heathrow Airport, together with support for other airports in the south east of England to make best use of existing runways.

3.18 Paragraph 1.39 of the NPS stated that:

> … the Government has confirmed that it is supportive of airports beyond Heathrow making best use of their existing runways. However, we recognise that the development of airports can have positive and negative impacts, including on noise levels. We consider that any proposals should be judged on their individual merits ... taking careful account of all relevant considerations, particularly economic and environmental impacts. (paragraph 1.39)

3.19 Meanwhile, paragraph 1.42 of the NPS stated that:

> … airports wishing to make more intensive use of existing runways will still need to submit an application for planning permission or development consent to the relevant authority, which should be judged on the application's individual merits. However, in light of the findings of the Airports Commission on the need for more intensive use of existing infrastructure as described at paragraph 1.6 above, the Government accepts that it may well be possible for existing airports to demonstrate sufficient need for their proposals, additional to (or different from) the need which is met by the provision of a Northwest Runway at Heathrow. As indicated in paragraph 1.39 above, the Government's policy on this issue will continue to be considered in the context of developing a new Aviation Strategy. (paragraph 1.42)

3.20 On 27 February 2020, the Court of Appeal ruled in favour of a challenge to the designation of the Airports NPS. Following an appeal of the decision from Heathrow Airport Ltd, the Supreme Court overturned the Court of Appeal's decision to block the Airport NPS in December 2020.

3B.2 Beyond the Horizon – The Future of UK Aviation: Making Best Use of Existing Runways (2018)

3.21 The government is currently in the process of preparing an updated national Aviation Strategy, which will replace the 2013 Aviation Policy Framework and respond to the Airports Commission's recommendation for other airports to make more intensive use of their existing infrastructure. While this revised strategy is still under preparation, the government in its policy statement 'Beyond the Horizon – The Future of UK Aviation: Making Best Use of Existing

[33] Airports Commission (2015), 'Airports Commission; Final Report', July, p. 339.
[34] Department for Transport (2018), 'Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England', June.

Runways'[35] reaffirmed its policy support for airports making best use of their existing runways:

> … the Government is supportive of airports beyond Heathrow making best use of their existing runways. However, we recognise that the development of airports can have negative as well as positive local impacts, including on noise levels. We therefore consider that any proposals should be judged by the relevant planning authority, taking careful account of all relevant considerations, particularly economic and environmental impacts and proposed mitigations. (paragraph 1.29)

3.22 The principle of making best use of existing airport capacity has therefore been a longstanding and consistent feature of UK aviation policy since 2003, and remains so today.

3.23 In addition, in its consultation document 'Aviation 2050 – the Future of UK Aviation' (December 2018), the government made it clear that it supports aviation industry growth and the benefits that this would deliver, provided that growth takes place in a sustainable way, with actions to mitigate the environmental impacts.

3B.3 Climate Change – Transport decarbonisation plan and the 'Jet Zero' consultation (2021)

3.24 Action against climate change is a policy priority in the UK and the sixth carbon budget (2033-37), sets the UK on a path to achieve an 80% reduction in carbon emissions by 2050 compared to 1990 levels. This target includes international aviation in its scope.[36]

3.25 Following the approval of the sixth carbon budget, the UK government released its plan to decarbonise the transport sector 'Decarbonising Transport: A Better, Greener Britain' and outlined 78 commitments and actions to achieve net zero carbon emissions in the transport system by 2050.[37] This plan sets out key commitments for the aviation sector and has been released along with the 'Jet Zero' consultation[38] which aims to gather views on the government's policies to decarbonise the sector.

3.26 The Transport Decarbonisation Plan acknowledges the role of international aviation in the UK economy and targets low carbon sector recovery:

> International connectivity is a vital part of Global Britain, and everyone should continue to have access to affordable flights, allowing them to go on holiday, visit family, and do business. But as the aviation sector recovers, a process likely to take several years, it must do so in a lower-carbon way. (page 8)

3.27 The Jet Zero consultation highlights preserving the benefits of air travel while progressing towards a decarbonised sector:

> The aim of our strategy is for aviation to decarbonise in a way that preserves the benefits of air travel and delivers clean growth of the UK sector by maximising the opportunities that decarbonisation can bring. (paragraph 2.1)

[35] Department for Transport (2018), 'Airports National Policy Statement and an accompanying policy document Beyond the Horizon – The Future of UK Aviation – Making Best Use of Existing Runways', June.
[36] 'The Carbon Budget Order 2021', June.
[37] 'Department for Transport (2021), 'Decarbonising Transport: A Better, Greener Britain', 14 July, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1007194/decarbonising-transport-a-better-greener-britain.pdf (last accessed 29 July 2021).
[38] Department for Transport (2021), 'Jet zero: our strategy for net zero aviation', 14 July, available at: https://www.gov.uk/government/consultations/achieving-net-zero-aviation-by-2050 (last accessed 29 July 2021).

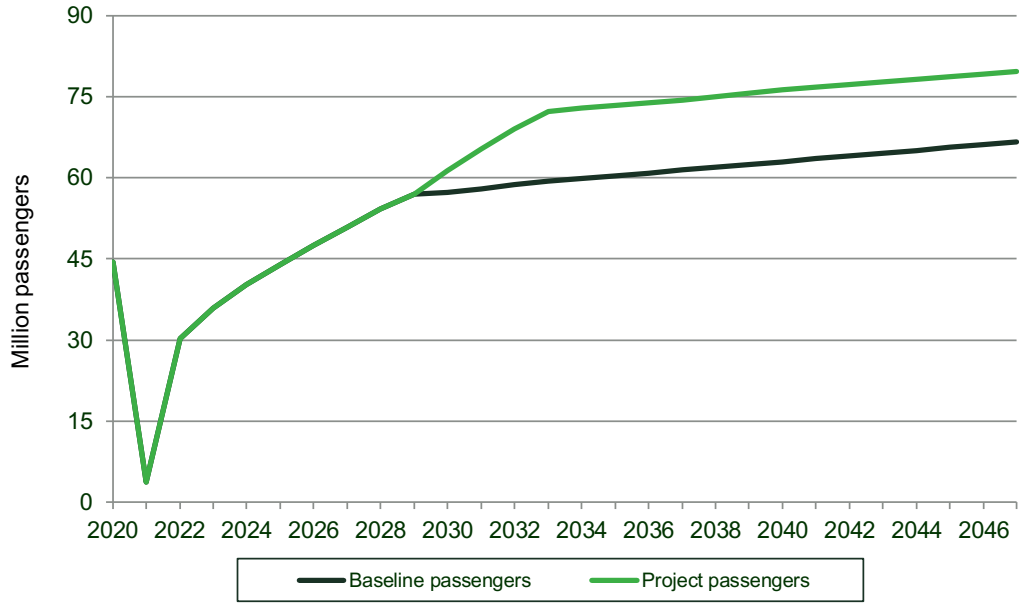
3.28 The dual goal of preserving its benefits (e.g. connectivity, affordability) while achieving net zero by 2050 appear to be the core principles of climate change policy as regards to the UK aviation sector going forward.

3C Traffic forecast scenarios

3.29 We have been provided with forecasts of air traffic from Gatwick to 2047, prepared by GAL and ICF. Figure 3.4 below shows the build-up of passenger volumes with the Project from the scheme opening year of 2029 (with the first full year of operations being 2030) compared with passenger projections in the Baseline (i.e. without the Project).

3.30 The forecasts suggest that, in the scenario where the Project goes ahead, passenger numbers would increase substantially following the scheme opening, and the growth rate would slow down slightly after 2032. The forecasts suggest an incremental increase of 61,000 ATMs and 13m passengers at the end of the forecast period, which is equivalent to about a 20% uplift over the baseline—see the figure below.

Figure 3.4 Gatwick traffic forecasts



Note: Passenger growth within the Baseline reflects assumptions on improved runway utilisation, increased load factors and plane sizes. Passenger growth with the Project reflects the same assumptions as the Baseline and additional ATMs enabled by the Project.

Source: GAL.

3.31 In this report, we focus on the results of the analysis based on the traffic forecasts shown in Figure 3.4 above.

3.32 The Forecast Data Book, which has been prepared by GAL, explains that the growth forecasts are likely to be towards the upper end of the level of growth that would occur. This approach has the benefit of ensuring that environmental assessment work derived from the forecasts does not understate environmental impacts. However, with respect to economic impacts, it is possible that this approach creates a risk that economic benefits could be overstated. For this reason, this report also provides impact estimates for a sensitivity around these forecasts in Appendix A7, which assumes slower passenger growth in the overall London system and at Gatwick. This sensitivity

aims to show the effect on the assessed economic impacts of lower levels of demand looking forward relative to those forecasted in the Data Book.

3D The COVID-19 pandemic and its impact on the economic assessment

3.33 The traffic forecasts take into account the effect that the COVID-19 pandemic has had since 2020, including the restrictions on air travel, which has affected Gatwick and other airports across the UK and around the world.

3.34 Figure 3.4 above suggests that GAL forecasts that passenger volumes will initially rebound strongly in 2021/22, before transitioning to a more steady recovery path and ultimately reaching 2019/20 levels of traffic in 2024/25 (i.e. approx. 45m passengers), and 'catching up' to pre-pandemic forecasts by 2028. IATA has estimated that global passenger traffic will return to pre-COVID-19 levels in 2024, which is in line with the ICF forecasts for Gatwick.[39]

3.35 By the time the Project is completed in 2029, the effect of the pandemic on the UK aviation sector as a whole, and Gatwick Airport in particular, is expected to have fully subsided. As a result, our analysis is based on the assumption made by GAL in producing the traffic forecasts that the COVID-19 pandemic will have a limited influence on the Project in the long run. While most inputs to the analysis rely on 2019 data as a reference year for the future state of the economy, some of our inputs have been adjusted to reflect the long-run impact of the COVID-19 pandemic where relevant and where up-to-date data was available to do so.

3E Study areas

3.36 Our analysis focuses on several geographical study areas. In particular, we have assessed the economic impact of the Project on the UK as a whole as well as on three sub-national areas. These three areas are defined below and are consistent with the areas modelled under the Gatwick Airport Master Plan.[40]

3.37 For administrative purposes, the area around Gatwick is divided into a number of Local Authority Districts (LADs) and county councils. Typically, LADs are a layer below county-level administrations. However, in some instances, this 'dual-layer' structure is discarded in favour of a single unitary authority—Brighton and Hove is an example. These administrative areas can be combined in a number of ways: one might consider impacts county by county, or by looking at aggregations of LADs such as those within the Coast to Capital LEP.

3.38 Our approach is as follows.

- We assess the local economic impact at the level of the seven LADs that surround the airport site and form the **Gatwick Diamond**, consistent with previous studies (Epsom and Ewell, Mole Valley, Reigate and Banstead, Tandridge, Crawley, Mid Sussex, and Horsham).[41]
- We quantify these economic metrics in the areas that form the larger **Coast to Capital LEP** area, a business enterprise partnership including Epsom and Ewell, Mole Valley, Reigate and Banstead, Tandridge, Crawley, Mid

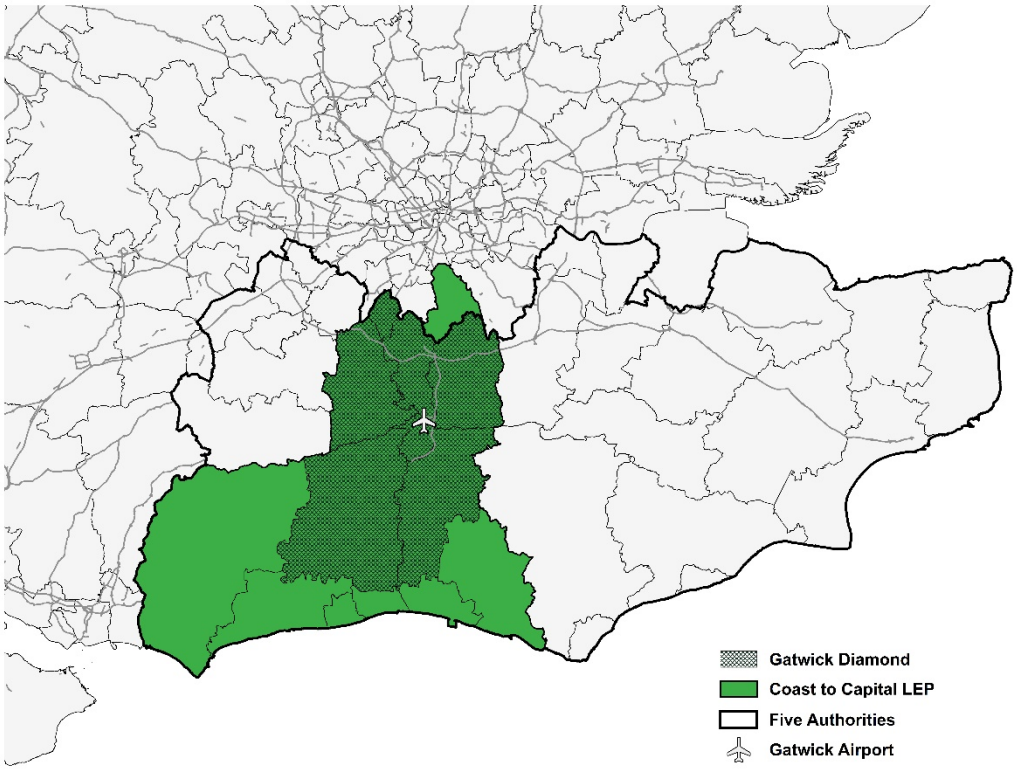
[39] IATA (2020), 'Recovery Delayed as International Travel Remains Locked Down', 28 July.
[40] Gatwick Airport (2019), 'Gatwick Airport Master Plan 2019', p. 111.
[41] For instance, Oxford Economics (2017), 'The economic impact of Gatwick Airport', January.

Sussex, Horsham, Croydon, Brighton and Hove, Lewes, Worthing, Arun, Chichester, and Adur.[42]

- We consider a series of other economic metrics that indicate the scale of Gatwick's economic significance to an even larger sub-regional area: the **Five Authorities Area** (West Sussex, East Sussex, Surrey, Kent, and Brighton and Hove).

3.39 Figure 3.5 shows the geographic coverage of this analysis.

Figure 3.5 The Gatwick Diamond and wider areas of study



Note: The Gatwick Diamond area is also part of the Coast to Capital LEP. Similarly, the shaded areas for the Coast to Capital LEP are also part of the Five Authorities area, except the London Borough of Croydon.

Source: Oxera.

3.40 The remainder of this report is structured as follows.

- Section 4 sets out our assessment of the impact of the Project at the national level. This assessment is focused on the net economic impacts to the UK.
- Section 5 contains Oxera's analysis of the local economic impacts. We estimate both gross and net impacts on the three study areas.

[42] Our definition of the Coast to Capital LEP area includes Croydon, consistent with the analysis for the Draft Master Plan (see Gatwick Airport (2018), 'Gatwick Airport Draft Master Plan 2018', November), which is no longer part of the LEP.

4 National impact of the Project

Box 4.1 Summary

This section provides an assessment of the impacts of the Project on UK society in accordance with the DfT's TAG, and presents a value for money assessment by evaluating the benefits and costs of the Project. We report our estimates in the DfT's base year for prices and values, 2010, and report discounted total benefits and losses arising from the Project over a 60-year period after the Project's opening in addition to the costs incurred during the Project's development.

By alleviating capacity constraints faced at Gatwick Airport during peak times, the Project would be expected to increase service frequencies by providing additional slots, reduce travel times by allowing a more efficient flight schedule, and reduce air fares by increasing the supply of air services. These changes are expected to attract more passengers to Gatwick Airport and the London aviation system more generally. Meanwhile, existing passengers are expected to enjoy lower fares, new routes, and higher frequencies on existing routes. We evaluate these expected changes in section 4C, and quantify their discounted impact on passengers to be within a range from £60.1bn to £78.8bn.

By providing increased connectivity, the Project is also expected to have impacts beyond aviation markets in the UK. These additional impacts are projected to yield benefits to businesses, provide new job opportunities to individuals, and increase productivity by bringing individuals and businesses together. We discuss and quantify these wider impacts arising from the Project in section 4D to be within a range from £4.7bn to £6.6bn. In the same section, we quantify expected changes in the government's tax revenues from APD to be £4.6bn.

In addition, the Project is expected to:

- increase competition in the aviation sector;
- increase the resilience of the airport and the other London airports to unexpected disruptions;
- increase freight capacity.

We discuss these benefits in sections 4G, 4H and 4I.

To provide these impacts, the Project is expected to have a financial cost to Gatwick Airport of £2.7bn. This is due to capital and operating expenditure including construction works converting the Northern runway for daily operations, construction of other new infrastructure and related refurbishment projects, and additional labour expenditure. This expenditure is expected to be privately financed—i.e. at no cost to the UK taxpayer.

In addition to these financial costs, lower fares and increased capacity are expected to reduce the value to airlines of providing services to existing passengers. We estimate this welfare transfer from airlines to passengers in section 4C to range from -£55.2 to -£66.9bn. Some of this decrease would be compensated for by the increased number of passengers and the resulting increase in airlines' operational revenues. Increased activity at the airport would also increase noise levels and GHG emissions, and decrease air quality. The social costs of these environmental impacts are discussed in section 4E and quantified to be £0.9bn to £3.5bn.

As a result of these quantified costs and benefits, we estimate that the NPV of the Project would be £10.5bn to £22.0bn in 2010 prices and values.

Note: Benefits may not sum due to rounding. Ranges refer to various assumptions used in the valuation of benefits and costs as outlined in the relevant subsections.

Source: Oxera.

4.1 HM Treasury Green Book guidance on scheme appraisals recommends assessing the costs and benefits of a scheme to UK society.[43] A cost–benefit analysis involves quantifying the relevant costs and benefits of a scheme. It is

[43] HM Treasury (2018), 'The Green Book Central Government Guidance on Appraisal and Evaluation', p. 21. We adopt this approach to ensure comparability of our assessment with previous appraisals by the DfT and Airports Commission.

then possible to calculate various cost–benefit metrics to assess the scheme's value. Specifically, we calculate:

- the benefits to users, providers, and to the wider economy,[44] which is the sum of the benefits to passengers, providers, the wider economy, and the government;
- the net social benefits and costs, which combine the benefits to users, providers, the wider economy, and the government with costs to providers and the environment;[45]
- the NPV, which combines all the costs and benefits from the scheme.

4.2 The DfT's TAG suggests that expansion at a capacity-constrained airport, such as that through the Project, will have direct economic impacts on air passengers, airlines, and the airport itself—i.e. it will enable more passengers to travel at reduced fares and at higher frequencies.[46]

4.3 The Project would relieve peak-time capacity constraints at Gatwick Airport, providing more options to airlines to offer aviation services and to passengers to benefit from these services. The impact of this capacity expansion, however, would go beyond aviation services at Gatwick Airport during peak times, as the additional capacity would be available at all times—for example, it would help the airport to recover from a disruption. It may also affect capacity at the other London airports as passengers may prefer to use new services at Gatwick Airport with the Project instead of using other London airports.

4.4 The increased activity at the airport with the Project is also expected to have other impacts such as providing additional employment opportunities, increasing resilience to unexpected disruptions, and increasing environmental costs associated with air travel including surface access. Costs and benefits associated with these impacts inform us about the value of the Project to UK society.

4.5 Part of this value is likely to materialise in the immediate vicinity of the airport. We examine such local impacts in section 5. In this section, following TAG, we analyse the impacts of the Project at a national (UK) level only. To this end, we evaluate differences between forecasts both with and without the Project in place, using the following principles:

- analysing only impacts that are additive at the national level;[47]
- analysing only impacts that are incremental because of the Project—i.e. considering only impacts that are different between the baseline and the Project scenarios;
- using an appraisal period ending 60 years after the scheme opening and including the period of scheme development;[48]
- using the same unit of account in all valuations;[49]

[44] Users and providers of aviation services are passengers, airlines, and airports. The 'wider economy' refers to non-aviation markets.
[45] As defined in Department for Transport (2018), 'Addendum to the Updated Appraisal Report Airport Capacity in the South East', June.
[46] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May.
[47] HM Treasury (2018), 'The Green Book Central Government Guidance on Appraisal and Evaluation', p. 21.
[48] Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', May, p. 3.
[49] Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', May, p. 5. We report our results in market prices. The choice of unit of account affects the scale of impacts, but it does not affect the sign of the cost–benefit metrics.

- using inflation-adjusted (real) prices (2010 prices);[50]
- reporting impacts in present values (2010 values).[51]

4.6 Following DfT guidance, we assess the value of the Project by first determining the total benefits of the Project to passengers, providers, and the wider economy (Table 4.17).[52] Then, we evaluate the environmental impacts of the Project and calculate the net social benefits arising from the Project (Table 4.23). Finally, we combine all quantified benefits and costs to calculate the NPV of the Project (Table 4.27).

4.7 We start our analysis by describing our scenarios.

4A Appraisal scenarios

4.8 We have modelled two scenarios as part of our analysis, and a sensitivity of our results to an alternative scenario with slower growth in passenger demand. Specifically, we have modelled a 'Baseline' and a corresponding 'Project' scenario.

- Our Baseline scenario is based on the baseline air traffic forecasts and fares that are expected to exist if the Project were not to proceed.
- Our Project scenario refers to traffic forecasts and fares in the event that the Project proceeds.

4.9 For consistency with the approach adopted in the traffic forecasts, it has been assumed in both of these scenarios that there will not be a third runway at Heathrow airport.[53]

4.10 Following the DfT's TAG, our analyses cover the 60-year period between 2029 and 2088, and also include all pre-2029 project-related development costs.[54]

4B Costs of the Project

4.11 GAL has provided Oxera with forecast capital expenditure (CAPEX) for the Baseline and the Project scenarios for all years between 2020/21 and 2038/39. The forecasts include all CAPEX related to expenditures on the airfield, car parks, hangars and terminals, construction, and surface access schemes.[55]

4.12 In order to undertake a value for money assessment, we have made a number of adjustments to the information provided by Gatwick Airport. It is also necessary to produce a projection for operating costs (OPEX). These are described in turn below.

[50] Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', May, p. 6. The DfT's price base year is 2010. Unless otherwise stated, we report all estimates in 2010 prices.
[51] Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', May, p. 7. The DfT's base year is 2010. Unless otherwise stated, we report all estimates in 2010 values.
[52] Department for Transport (2017), 'Updated Appraisal Report Airport Capacity in the South East', October, p. 43.
[53] Further work will be undertaken to consider what the economic impacts of the Project would be if the opening of third runway at Heathrow were to come forward.
[54] 2029 is expected to be the first full year of operation at Gatwick Airport with the Project in place.
[55] We have only the annual total CAPEX. As such, we cannot identify the proportion of CAPEX related to construction works. However, we do not expect these expenditures to have a stimulating effect on the construction industry at a national level, and do not evaluate potential benefits arising from this. Even if construction were a large component of the Project's estimated CAPEX, the total CAPEX of the whole project at £2.8bn is small compared with the annual size of the construction industry in the UK. For example, the ONS reports the annual size of new construction works in 2019 to be £119bn. Office for National Statistics (2021), 'Construction statistics, Great Britain: 2019', January.

4B.1 CAPEX

4.13 We have received CAPEX forecasts for the Project from Gatwick Airport up to the financial year 2038/39. According to these forecasts, the Project's CAPEX is estimated at £2.8bn in Q4 2019 nominal prices.[56] To ensure consistency with the TAG cost assessment module, we have made the following adjustments to the CAPEX forecasts:[57]

- costs have been deflated and discounted to the DfT's base year, 2010;[58]
- real costs have been recast from financial years to calendar years;
- to estimate additional CAPEX in the future arising from activities such as additional maintenance required for the new runway, real costs between 2038 and 2088 are assumed to grow in line with real GDP;[59]
- an indirect tax correction factor of 1.19 has been applied to convert factor costs into market prices;[60]
- a 44% optimism bias is applied to uplift CAPEX estimates.[61]

4.14 With these adjustments, we estimate the present value of the Project's CAPEX to be £2.4bn in 2010 prices and values.

4B.2 OPEX

4.15 The additional air traffic associated with the Project would increase OPEX for GAL.[62] We have modelled how the Project would affect OPEX by considering increases in real factor costs, efficiency, and passenger throughput. The basis for these assumptions is set out in Box 4.2 below. This is a high-level exercise for this economic appraisal. It does not represent a detailed estimate of the various operational expenditures that would result from the Project.

4.16 On the basis of this exercise, we estimate the present value of the Project's OPEX to be £0.4bn in 2010 prices and values.

[56] The estimated CAPEX that we received includes risk adjustment produced with a quantitative risk assessment using P-value P50.
[57] Department for Transport (2017), 'TAG Unit A1.2 Scheme Costs', July.
[58] Deflation rates are sourced from Department for Transport (2020), 'TAG Data Book Annual Parameters', July. Annual discount rates are sourced from HM Treasury (2018), 'The Green Book Central Government Guidance on Appraisal and Evaluation', p. 105 as 3.5% for the first 30 years starting from the current year and 3.0% for the rest of the appraisal period. An annual discount rate of 3.5% is applied to discount values from the current year to the DfT's base year.
[59] Department for Transport (2020), 'TAG Data Book Annual Parameters', July.
[60] Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', May, p. 5.
[61] HM Treasury (2013), 'Supplementary Green Book Guidance Optimism Bias', April, p. 2.
[62] The Project would also have an impact on the OPEX of the other airports in the London aviation system if air passengers switched to Gatwick Airport due to the Project—if fewer passengers travelled from the other airports, they would incur less OPEX. Our analysis does not quantify this reduced OPEX and therefore it may be an overestimate of the Project's OPEX impact on the London airports as a whole.

Box 4.2 The Project's OPEX projection

We have constructed projections for the incremental OPEX with the Project (i.e. the difference between the Baseline and Project scenarios). We start with forecasts, received from GAL, of OPEX until 2024/25 excluding depreciation. The projection is derived through the following steps:

- received OPEX levels between 2021 and 2025 are deflated to 2010 prices;
- OPEX base levels are recast from financial years to calendar years;
- an indirect tax correction factor of 1.19 is applied to convert factor costs into market prices;
- ICF employment forecasts are used to determine the increase in employment at GAL with the Project up to 2047;
- real wage per employee is assumed to grow with forecast real wage to reflect increasing labour productivity over time.[63] As the level of traffic is assumed to be constant after 2047, real OPEX for employment is assumed to be constant after 2047;
- real price of utilities is assumed to grow with forecast real cost of industrial electricity supply;[64]
- real price of other OPEX items is assumed to be constant in real terms—i.e. to grow with forecast inflation in nominal terms;
- consumption of non-employment items is assumed to increase as passenger traffic increases based on a relationship taken from Gatwick Airport's historic regulatory determination;[65]
- we assume operational efficiency improvements of 1% per annum for OPEX for non-employment items;
- expected OPEX of the other new infrastructure with the Project is added from received cost forecasts;
- values are discounted to 2010 values.

Source: Oxera.

4.17 Below, we discuss various impacts of the Project and quantify their costs and benefits where practical.

4C User and provider impacts

4.18 In this section, we assess the impacts of the Project on users (passengers) and providers (airlines and airports) of aviation services.

4.19 A capacity expansion at an airport generates a variety of effects that provide benefits and losses to passengers, airlines and the airport by relieving capacity constraints. This can lead to a range of outcomes, including:

- a reduction in fares;
- increased route frequencies;
- an increase in passenger numbers resulting from lower fares and higher frequencies;
- a reduction in profits to airlines due to reduced fares that is partly offset by increased passenger numbers. This is a result of relieved capacity

[63] Office for Budget Responsibility (2020), 'Long-term economic determinants - March 2020 Economic and fiscal outlook', March.
[64] Department for Business, Energy & Industrial Strategy (2020), 'Valuation of energy use and greenhouse gas emissions for appraisal - Data tables 1 to 19: supporting the toolkit and the guidance', March.
[65] Specifically, using an elasticity of 0.3 based on Civil Aviation Authority (2014), 'Economic regulation at Gatwick from April 2014: Notice granting the licence', February, p. 166.

constraints with the Project, and airlines would continue making normal profits;

- an increase in airport revenues as a result of an increase in the number of passengers and frequencies.

4.20 When combined, these effects change the level and distribution of the economic value generated in an aviation market.

4.21 Prior to the COVID-19 pandemic, Gatwick Airport was capacity-constrained during peak times, and this is expected to arise again under the Baseline scenario as air traffic recovers. The Project would relieve these constraints and provide additional available capacity to airlines, including during desirable peak times. As airlines fill this additional capacity, ATMs and passenger numbers at Gatwick Airport would increase beyond baseline levels, as illustrated in section 3C.

4.22 Although the expansion would primarily affect operations at Gatwick Airport, its impact would not be limited to the passengers and airlines using the airport. Due to its location and the connectivity it provides, Gatwick Airport forms part of a wider system of airports in London and the surrounding area.[66] We would therefore expect the Project to have an impact on passengers and businesses using London airports more generally, and we evaluate the impacts of the Project within this system.[67]

4.23 Increased frequencies and passenger numbers in the London aviation system are likely to result in lower fares because of supply and demand dynamics in aviation markets. The DfT provides an approach to illustrate and evaluate these impacts, which we describe below.

4C.1 The DfT's approach to aviation appraisal

4.24 The DfT's approach to estimating the user and provider benefits of an expansion in an airport's capacity focuses on measuring benefits to passengers and airlines.[68] These are known as user and provider surpluses, respectively, and are defined as follows:

- user surplus represents the value of aviation services to passengers beyond the actual price that they pay. This surplus is therefore the difference between the maximum amount that passengers would be willing to pay and the actual price that they pay for aviation services;
- provider surplus represents the value to the airlines and airports from providing aviation services. An airline's surplus depends on the incremental price that it can charge due to capacity constraints beyond the costs that it incurs. An airport's surplus is the increased value that it receives from providing more capacity.

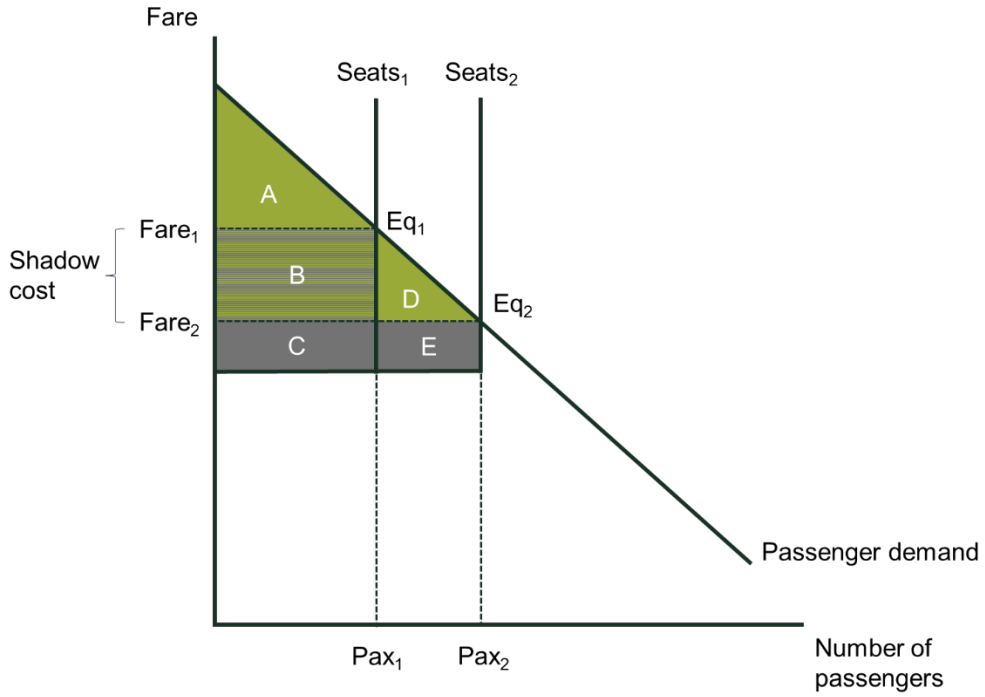
4.25 The DfT's analytical framework to analyse changes in user and provider surpluses takes into account various features of a passenger–airline market. In this market, passengers demand seats, and airlines supply seats, up to the

[66] The airports in the London aviation system are City, Gatwick, Heathrow, Luton, Southend, and Stansted airports.
[67] Using London-level traffic forecasts to assess the impacts of an expansion also addresses the impacts of potential substitution between different London airports. For example, if some passengers who would travel using other airports in the Baseline scenario decide to travel using Gatwick Airport in the Project scenario, passenger numbers at Gatwick Airport would increase but this would not affect the passenger numbers in the London aviation system.
[68] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May.

total demand or available airport capacity. Airports, in turn, provide capacity and set the maximum number of passengers, or flights, that can take place in the market.

4.26 If airport capacity is sufficient to meet total passenger demand, airlines provide enough seats to match this and air fares are at competitive market clearing prices. Conversely, if airport capacity is less than the total passenger demand, airlines will be unable to satisfy the demand for seats. Fares paid by passengers will rise above costs in order to clear the market. This increase due to a lack of capacity is referred to as the 'shadow cost' of constraints on air fares. Figure 4.1 illustrates the impact of airport capacity constraints, the generation of shadow costs within this market framework, and the resulting changes to user and provider surpluses.

Figure 4.1 The DfT's conceptual framework



Note: The figure illustrates the relationship between passenger demand and air fares in an aviation market. Subscripts 1 and 2 indicate scenarios without and with an expansion, respectively. Pax_1 and Pax_2 are the number of passengers using aviation services. Seats_1 and Seats_2 represent the supply of aviation services by airlines. Eq_1 and Eq_2 are the market clearing price and demand levels at these prices in each scenario. Green areas represent user surplus. Grey areas represent producer surplus. Striped grey and green areas represent a transfer of surplus from producers to users with the capacity expansion.

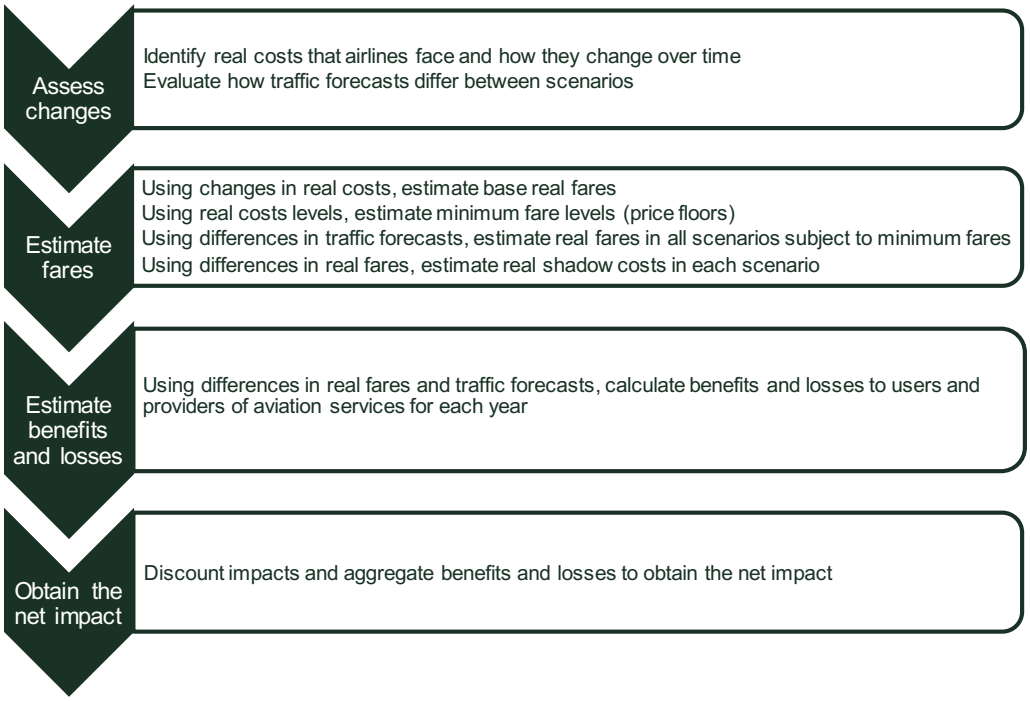
Source: Oxera based on Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May, p. 13.

4.27 In Figure 4.1, with a capacity expansion, the line representing capacity Seats_1 moves to the right to represent the increased capacity Seats_2, fares fall from Fare_1 to Fare_2 and the number of passengers increases from Pax_1 to Pax_2. As a result, user surplus increases by B + D and becomes A + B + D, and provider surplus changes to C + E from B + C. Airports incur the costs of the expansion. However, as there are also more passengers, they may earn higher revenues.

4C.2 Quantification approach

4.28 Our approach to quantifying the user and provider benefits of the Project makes use of airline costs, traffic forecasts, and current fare levels to estimate fare levels for each scenario. The calculations are shown in Figure 4.2.

Figure 4.2 User and provider impacts model structure



Source: Oxera.

4.29 We now describe each of these steps in turn and the data used in our assessment.

4C.3 Assess changes

4.30 We start our analysis by evaluating expected changes in traffic levels with the Project and real costs that airlines face over time.

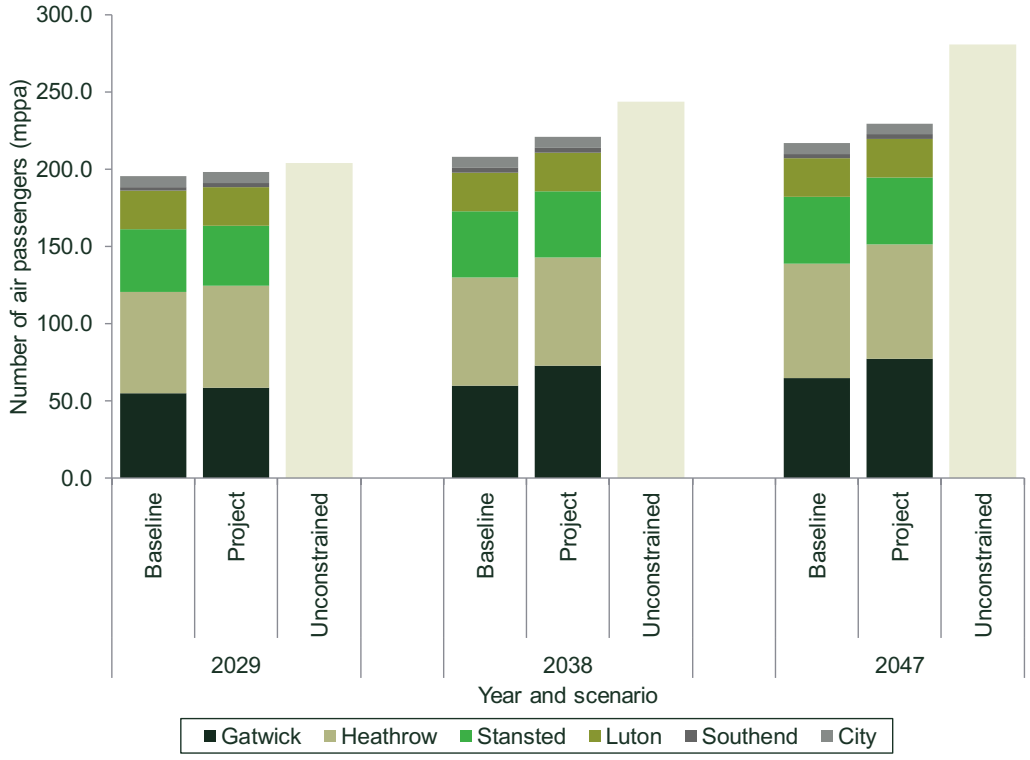
Traffic forecasts

4.31 We have been provided with traffic forecasts for Gatwick Airport and the London aviation system from ICF and GAL. These forecasts provide passenger numbers in the years 2029, 2038 and 2047 for the Project and Baseline scenarios.[69]

4.32 We have also received the forecasts for a hypothetical scenario without any capacity constraints on the London aviation system from ICF—an unconstrained scenario. Figure 4.3 illustrates passenger forecasts for the Baseline, Project and unconstrained scenarios. It shows how the traffic in the Baseline and Project scenarios is expected to evolve over time compared with the unconstrained demand.

[69] We interpolate values for the years in between linearly, and assume that passenger numbers after 2047 are constant.

Figure 4.3 The London aviation system passenger forecasts

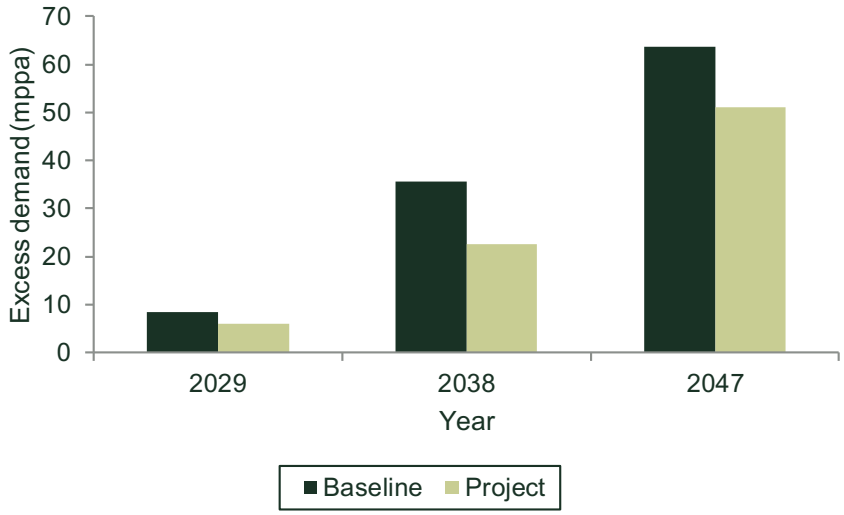


Note: International-to-international transfer passengers are excluded from passenger numbers. The unconstrained scenario reflects the total London aviation market, with no allocation of passengers to different airports.

Source: ICF.

4.33 In general, the forecasts indicate that the London aviation system is expected to become increasingly capacity-constrained over time. Figure 4.4 illustrates the forecast for excess passenger demand in the Baseline and Project scenarios. The figure indicates that excess demand in the London aviation system is forecast to be higher in 2038 and 2047 than it is in 2029, and the Project enables access to aviation services to a proportion of these potential passengers.

Figure 4.4 Excess demand in the London aviation system



Note: The figure illustrates forecast numbers of passengers who would have travelled using London airports but cannot due to airport capacity constraints.

Source: ICF.

4.34 Passenger traffic in each of these scenarios is disaggregated according to the following market segments:

- origin (UK, foreign);
- journey purpose (business, leisure);
- type (domestic, short-haul, long-haul).

4.35 Increased capacity affects not only passenger demand but also air fares, as discussed in section 4C.4. To evaluate the impact of the Project on air fares, a forecast of air fares is required. Below, we evaluate how an important component of air fares—airlines' costs—is expected to evolve over time.

Airlines' costs

4.36 The DfT's UK Aviation Forecasts categorise costs that airlines face as fuel, carbon, APD, and 'other costs' (all fare elements not attributed to fuel, carbon and APD).[70] The DfT forecasts also include information on each component's share in the average air fare and how each component is expected to grow over time until 2050. As an example, Table 4.1 shows shares of fare components in 2019 average fare levels, adjusted for the inclusion of 'normal' profit.[71] We use this data to assess costs that airlines are expected to face up to 2050. Thereafter, we assume that these costs remain constant in real terms up to 2088.

[70] Department for Transport (2017), 'UK Aviation Forecasts: Moving Britain Ahead', October. Other costs include shadow costs as they are a part of the observed price levels in a constrained system. In addition to these cost components, we allow for 'normal' profits—i.e. profits that airlines would earn in competitive market conditions in which sufficient capacity is made available to meet underlying demand. In line with historical data pre-COVID-19, this component is assumed to be constant at 2% of turnover. This parameter is sourced from Regional International (2019), 'The state of the airline industry in Europe', March/April, https://www.iata.org/en/iata-repository/publications/economic-reports/state-of-the-airline-industry-in-europe, accessed 5 May 2021. We also present a sensitivity of our estimates to this parameter in section 4C.7.

[71] As this forecast was produced by the DfT in 2017 (the most recent aviation forecast published by the DfT), forecasting future prices using these shares would be consistent with assuming that the pandemic will have a limited long-term impact, as discussed in section 3D.

Table 4.1 Share of fare components in 2019 average fare levels (%)

Fuel	Carbon	Normal profit	Other	APD
19.8	0.7	2.0	68.2	9.2

Note: Values are shares of each component in the weighted average air fare. Values may not sum to 100 due to rounding.

Source: Oxera analysis of Department for Transport (2017), 'UK Aviation Forecasts'.

4.37 Table 4.2 shows how each cost component is expected to grow over time in real terms for selected years of the DfT's forecast. We assume that real APD is constant over time.[72]

Table 4.2 Year-on-year real growth rates of cost components (%)

	2026	2029	2038	2047
Fuel	2.1	1.8	-1.8	-0.7
Carbon	16.0	10.0	3.7	3.0
Other	-0.6	-0.5	0.1	0.1

Note: All growth rates are calculated using values in 2010 prices. Values are growth rates in each spot year. Reductions in fuel prices reflect expected changes in oil prices and increased fuel efficiency of new-generation aircraft. The evolution of the share of carbon costs in average real fares reflects expected fuel efficiency gains over time.

Source: Oxera analysis of Department for Transport (2017), 'UK Aviation Forecasts'.

4C.4 Estimate fares

4.38 Fares are an important driver of passenger demand for aviation services and a necessary component of the DfT's appraisal framework. Because the traffic forecasts do not include data on fare levels for each scenario, we infer future fare levels for our Baseline and Project scenarios. We then compare the two, which provides an estimate of the impact of the Project on fares. To do this, we use 2019 average fare levels provided by ICF for each market segment,[73] changes in costs faced by airlines, and traffic forecasts. The estimation process is explained in more detail below.

Cost component disaggregation and fare levels in the Baseline scenario

4.39 In order to forecast fare levels, we use the average fare levels for different market segments in the London aviation system provided by ICF, the respective shares of cost components, and forecast growth rates of each cost component from DfT forecasts.[74]

4.40 The first stage in this process is to disaggregate the average fare level into its cost components. We then forecast each cost component separately before aggregating them to obtain the forecast fare level in the Baseline scenario.[75] Table 4.3 presents a worked example of how fare levels are estimated for each year in a simplified scenario of two cost components.

[72] Our analysis includes new APD rates from 2022. For more details, see HM Revenue & Customs (2021), 'Rates for Air Passenger Duty', https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty, accessed 3 May 2021.
[73] We use air fares from 2019 as base fares, since this is the latest year unaffected by the COVID-19 pandemic. Forecasting future fares using 2019 base fares would be consistent with assuming that the pandemic will have a limited long-term influence on the aviation market, as discussed in section 3D.
[74] Department for Transport (2017), 'UK Aviation Forecasts: Moving Britain Ahead', October.
[75] UK residents and foreign residents are assumed to face the same fares.

Table 4.3 Worked example of fare calculations using forecast cost components

	2021	2022
Current average real fare (A)	55	
Share of cost 1 (S1)	40%	
Share of cost 2 (S2)	60%	
Real value of cost 1 (B = A*S1)	22	
Real value of cost 2 (C = A*S2)	33	
Yearly real growth of cost 1 (G1)	5%	
Yearly real growth of cost 2 (G2)	-1%	
Forecast real value of cost 1 (D = B*(1+G1))		23.10
Forecast real value of cost 2 (E = C*(1+G2))		32.67
Forecast real fare level (D+E)		55.77

Note: Values are for illustrative purposes only. Our actual analysis includes more cost components, as described in section 4C.3.

Source: Oxera.

Fare levels for other scenarios

4.41 The forecast fare levels resulting from the above process are used as the fare levels in the Baseline scenario. To obtain fare levels in the Project and the unconstrained scenarios,[76] we estimate the changes in fares using differences in traffic forecasts and relationships between fares and passenger demand in each passenger market. This section describes this process in more detail.

4.42 We estimate fares for each scenario in three steps:

- we compare demand forecasts in different scenarios;
- we calculate the required changes in fares using a fare elasticity of demand;
- we compare the estimated fare levels required for the demand forecasts with the airline costs expected in each year for each market. If the predicted fare is below the costs, we use the cost level as the fare for that year in that market.[77]

4.43 A fare elasticity of demand is defined as the percentage change in demand as a response to a 1% change in fare levels:

$$\%\ \text{change in demand} = \text{fare elasticity} * \%\ \text{change in fare}$$

4.44 This formula can be rearranged to give the required change in fare levels to rationalise differences in passenger numbers between two scenarios:

$$\frac{\%\ \text{change in demand}}{\text{fare elasticity}} = \%\ \text{change in fare}$$

4.45 We derive fares for all scenarios using this relationship and differences in traffic forecast volumes. To this end, we source price elasticities for different market segments from a meta-study of 129 elasticity estimates from 18

[76] The unconstrained scenario refers to air traffic forecasts without any capacity constraints in the London aviation system.
[77] This is to ensure that airlines do not set prices below cost plus a normal profit. Price floors affect business passenger markets only, as implied fares in leisure passenger markets—where demand responses to changes in prices are stronger—do not fall below cost levels.

studies.[78] We present these elasticities in Table 4.4. The DfT also provides a set of fare elasticities for the business, leisure and domestic passenger markets. In section 4C.7, we perform a sensitivity analysis using the DfT elasticities.[79]

Table 4.4 Fare elasticities of demand for different market segments

Business passengers			Leisure passengers		
Domestic	**Short-haul**	**Long-haul**	**Domestic**	**Short-haul**	**Long-haul**
-1.15	-0.70	-0.27	-1.10	-1.52	-1.04

Source: Gillen, D., Morrison, W.G. and Stewart, C. (2007), 'Air Travel Demand Elasticities : Concepts, Issues, and Measurement', *Advances in Airline Economics*, **2**, pp. 365–410.

4.46 Elasticities represent the strength of the demand response to changes in prices. For example, a -1.04 elasticity for long-haul leisure passengers implies that, if prices for long-haul leisure passengers increase by 1%, demand from these passengers for aviation services will decline by 1.04%. In the event that some passengers respond to changes in prices weakly (i.e. as elasticities get closer to zero), large changes in prices may be required to rationalise large differences in demand across different scenarios.[80]

4.47 Traffic forecasts suggest that differences in demand between the Baseline scenario and the other scenarios can be as high as 43% in some passenger segments.[81] To ensure that forecast passenger demands and prices are consistent within a scenario, and fares that airlines set are not below their costs for providing aviation services, we use a price floor that sets the minimum fare that can be observed in each passenger market in each year. We calculate the minimum fares using the airline costs that we describe above in section 4C.3.[82]

4.48 Table 4.5 illustrates how changes in fare levels are calculated, using the fare levels of long-haul leisure passengers as an example.

[78] Gillen, D., Morrison, W.G. and Stewart, C. (2007), 'Air Travel Demand Elasticities : Concepts, Issues, and Measurement', *Advances in Airline Economics*, **2**, pp. 365–410. We use median estimates for each market segment. These elasticities are also used as an input to other studies such as InterVISTAS (2007), 'Estimating Air Travel Demand Elasticities Final Report', prepared for IATA, December.

[79] For this sensitivity, we use DfT elasticities available in Department for Transport (2017), 'UK Aviation Forecasts: Moving Britain Ahead', October, p. 22. These elasticities are more aggregate than the elasticities we use in our main estimation. They are also lower in absolute value, implying that larger price changes would be required to rationalise changes in demand for aviation services. Elasticities that we use in our main estimation would therefore suggest smaller price changes with the Project and are likely to result in a more conservative estimate of total benefits.

[80] For example, to rationalise a 1% increase in demand in the long-haul business market, prices need to decline by 3.7% using an elasticity of -0.27.

[81] The largest differences are between the Baseline and unconstrained scenarios.

[82] We calculate minimum fares as the sum of expected fuel costs, carbon costs, normal profits and a proportion of other costs. The proportion represents the assumed share of other costs that would not vary with the Project. As 'other costs' include shadow costs as well as other fixed costs of providing aviation services, it is not straightforward to identify a particular value for this proportion—increasing proportions would put an increasing limit on the level of shadow costs in the London aviation system at any given year, and the proportion of shadow costs would change over time as other fixed costs would decline due to efficiency improvements and shadow costs would increase due to increased constraints in the Baseline scenario. As such, when implied fares are identified that are lower than estimated costs, we assess a range of outcomes assuming proportions between 25% and 75%. We also illustrate a sensitivity where we do not assume a proportion but adjust the elasticities in the markets where implied fares are lower than the sum of fuel, carbon, and normal profits. We describe this sensitivity below in section 4.3.7.

Table 4.5 Example of fare calculations

	Value
Change in demand with the expansion (A)	1.4%
Price elasticity (B)	-1.04
Fare change needed to rationalise demand change (C = A/B)	-1.3%
Fare without the expansion (D)	£398.4
Fare implied by elasticities [D*(1+C)]	£393.2
Estimated minimum fare (E)	£395.0
Fare with the expansion (F)	£395.0

Note: Values may not sum due to rounding. If the estimated minimum fare (E) were lower than the fare implied by elasticities, the fare with the expansion (F) would be equal to the fare implied by elasticities.

Source: Oxera.

4.49 Table 4.6 summarises our forecast fare levels by destination type in the Baseline and Project scenarios.

Table 4.6 Weighted average forecast fare levels by destination type

	Baseline		
	2029	**2038**	**2047**
Domestic	78.9	81.7	82.5
Short-haul	103.8	107.6	108.2
Long-haul	569.0	593.7	601.1

	Project		
	2029	**2038**	**2047**
Domestic	78.2	77.9	79.2
Short-haul	102.6	100.2	101.6
Long-haul	539.0	504.6	535.2

Note: Average fares are in 2010 prices. Numbers of business and leisure passengers in each segment and scenario are used as weights. A price floor that includes expected fuel costs, carbon costs, normal profits and 50% of other costs is considered when predicted fares are below minimum costs. This was the case for long-haul business fares only. All values are at the London system level.

Source: Oxera.

Estimate shadow costs

4.50 We calculate differences in shadow costs between the Baseline and Project scenarios as differences in fare levels (adjusted for normal profit):

$$\text{Change in shadow cost} = (1 - \text{Share of normal profit}) \times (\text{Fare}_{\text{Baseline}} - \text{Fare}_{\text{Project}})$$

4.51 Levels of shadow costs in the Baseline scenarios are calculated similarly using differences between fare levels of the Baseline scenarios and the unconstrained scenario.[83]

4.52 Table 4.7 shows the passenger demand and weighted averages of estimated fare levels and shadow costs in the London aviation system. The results

[83] In the unconstrained scenario, shadow costs are zero because there are no capacity constraints.

suggest that the Project scenario would reduce shadow costs by relieving capacity constraints.

Table 4.7 London system excess demand, fares, and shadow costs

	Baseline		
	2029	**2038**	**2047**
Excess demand (%)	4.1	14.7	22.7
Passengers (mppa)	195.5	207.8	216.9
Average fare (£)	216.6	229.7	240.5
Average shadow cost (£)	27.2	49.4	55.6
	Project		
	2029	**2038**	**2047**
Excess demand (%)	2.9	9.3	18.2
Passengers (mppa)	197.9	220.8	229.5
Average fare (£)	209.8	203.0	217.6
Average shadow cost (£)	19.4	22.2	33.5

Note: Average fares and shadow costs are in 2010 prices. Average values are averages of all market segments weighted by numbers of passengers in corresponding segments and scenarios. A price floor that includes expected fuel costs, carbon costs, normal profits and 50% of other costs is considered when predicted fares are below minimum costs. All values are at the London system level. International-to-international transfer passengers are excluded from the passenger numbers.

Source: Oxera.

4.53 In the following section, we explain how we use these estimates to calculate the benefits of an expansion to users and providers of the London aviation system for each year.

4C.5 Estimate benefits and losses

4.54 We have described how the Project would affect capacity and fares in the London aviation system. Together, these changes generate benefits and losses to passengers, airlines and airports. The Project may have an additional impact by changing travel times. We describe how we calculate these benefits and losses below.

Benefits and losses through changes in fares and passenger numbers

4.55 The Project's impacts on fares and passenger numbers generate benefits and losses through changes in user and provider surpluses.

4.56 The TAG aviation appraisal unit defines the total change in provider surplus (PS) as the difference in values that airlines generate through shadow costs between a Baseline and a Project scenario:[84]

$$\text{PS} = n_{Project} \times sc_{Project} - n_{Baseline} \times sc_{Baseline}$$

where $n_{Baseline}$ and $n_{Project}$ are numbers of passengers in the Baseline and Project scenarios, and $sc_{Baseline}$ and $sc_{Project}$ are shadow costs in these scenarios.[85]

[84] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May, p. 5.
[85] Shadow costs in our analysis are evaluated at the market price unit of account. For more information on perceived costs see, for example, Department for Transport (2018), 'TAG Unit A1.1 Cost-Benefit Analysis', Appendix B, March.

4.57 The total change in user surplus (US) that passengers receive as a result of a capacity expansion can be calculated using the following relationship:

$$\text{US} = 0.5 \times \left(n_{Baseline} + n_{Project}\right) \times \left(f_{Baseline} - f_{Project}\right)$$

where $f_{Baseline}$ and $f_{Project}$ are fare levels with and without capacity expansion.

4.58 With increased traffic, airport revenues in the London aviation system will increase. An assumption on airport charges is required to estimate this increase. Many factors, such as the form of economic regulation, security requirements and macroeconomic developments, could influence how airport charges will evolve over the long horizon of our assessment. For our analysis, and for illustrative purposes, we assume that airport charges remain constant in real terms and calculate the change in airport revenues with the Project using the following steps:

- we obtain the average aeronautical revenue and non-aeronautical revenue per passenger for each London airport, expressed in 2010 prices;[86]
- we adjust for non-aeronautical revenue. In this case, we assume that real non-aeronautical revenue per passenger from new passengers is equivalent to 80% of revenue from existing passengers.[87]

4.59 The total benefit of an airport expansion to users and providers of the aviation market for a particular year is calculated by summing the benefits to passengers, airlines and airports.

4.60 In addition to the impact of changes in fares, academic research indicates that passengers respond positively to increases in flight frequencies.[88] The increase in demand seen in the passenger forecasts would be driven by a mix of reduced fares and increased frequencies.

4.61 Our analysis is not able to capture frequency effects because traffic forecasts do not differentiate between additional passenger demand induced by fare reductions and that induced by increased frequencies.[89] As such, in our analysis, the increase in passenger demand is fully attributed to a reduction in fares.[90] This does not affect expected passenger volumes overall. However, it does mean that the impact of the change in fare levels, and therefore the benefits arising from changes in air fares (but not the overall benefits), will be overstated. Box 4.3 below describes why, for a given change in the number of passengers, this overestimation of benefits arising from changes in air fares is lower than the omitted benefits arising from changes in frequencies and

[86] We obtain these values from the airports' latest available financial statements before the COVID-19 pandemic. Aeronautical revenues are revenues from the processing of aircraft and passengers, and non-aeronautical revenues are revenues from other sources such as retail services and car parks. We assume that real revenue per passenger is constant over time at each airport.
[87] This is to reflect the potentially lower spending of passengers who start using aviation services because of reduced fares with the expansion. This assumption yields a conservative estimate of airport revenues. For example, see CEPA (2019), 'Heathrow Interim H7 Price Control: Review of HAL's initial submission', February, p. 38. With the Project, only an increase in the revenue of Gatwick Airport is expected. However, some of this increase may be due to switching passengers. The total increase in revenue of the whole system would therefore be less.
[88] For example, see Jorge-Calderón, J.D. (1997), 'A demand model for scheduled airline services on international European routes', *Journal of Air Transport Management*, **3**:1, pp. 23–35.
[89] Our analysis of user and provider impacts therefore constitutes benefits generated through fare reductions only.
[90] This is as long as prices are above estimated price floors. We assume that prices are equal to costs, including normal profits, if the implied prices are lower than the price floors, as discussed in paragraphs 4.47 and 4.48.

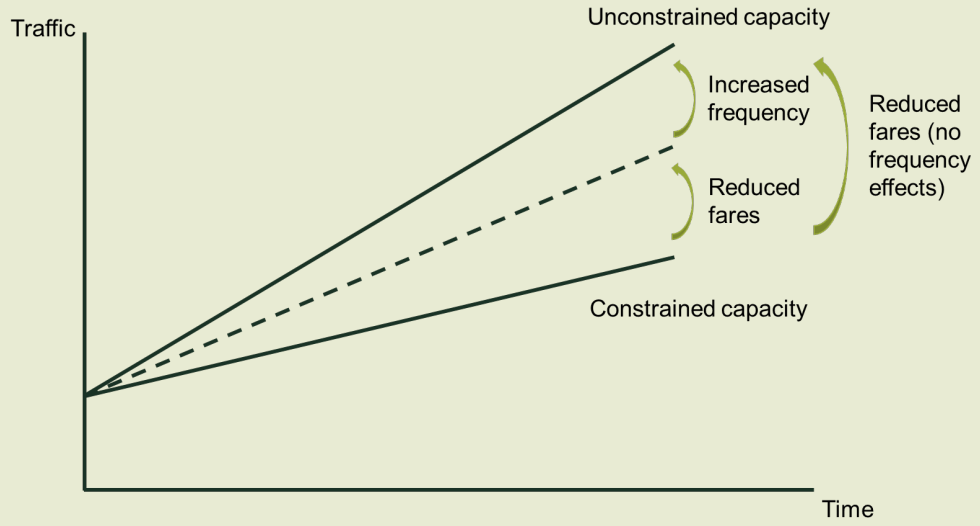
therefore results in a conservative estimate of the total impact of the Project on users and providers.

Box 4.3 Impacts of omitting frequency effects

Capacity constraints lead to reduced frequency and higher fares than in an unconstrained market. These, in turn, cause welfare losses: some passengers would have been willing to travel at the fare and level of service provided in an unconstrained market, but either do not travel or choose to accept lower service levels and higher fares.

When the effects of changes in frequencies are omitted, required changes in prices that equate supply and demand are overestimated: all changes in demand are attributed to changes in fares. Figure 4.5 illustrates this relationship.

Figure 4.5 Fare reductions without frequency effects

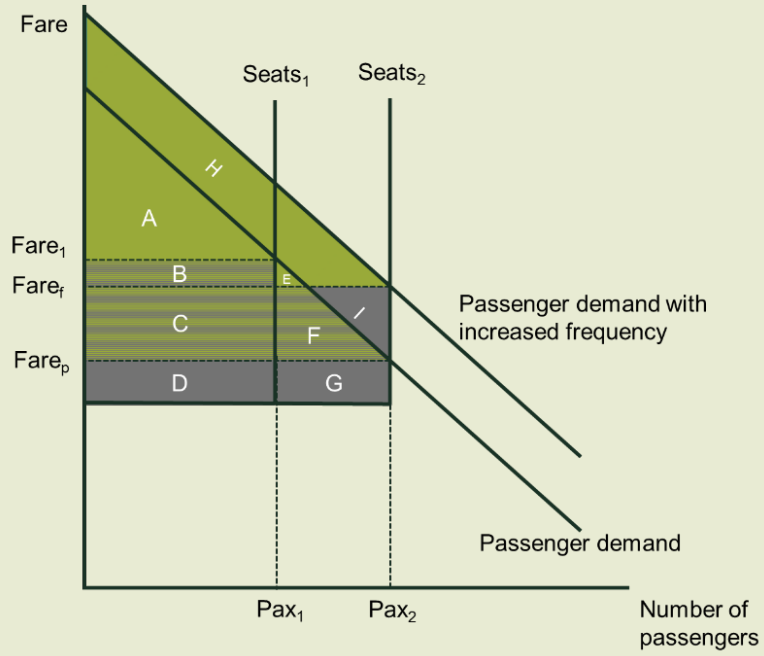


Note: The figure above presents a simplified illustration of how capacity constraints affect air traffic levels through frequency and price effects. If frequency effects are not accounted for to rationalise differences between two given traffic forecasts, changes in air traffic are fully attributed to reduced fares.

Source: Oxera.

The impact of this omission is a conservative estimate of the total benefits that arise from a capacity expansion. To see this, we can extend the framework illustrated in Figure 4.1 with frequency effects as in Figure 4.6.

Figure 4.6 Extending the framework with frequency effects



Note: The figure illustrates the impact of a capacity expansion with and without frequency effects. Fare_1 is the fare level without an expansion. Fare_f and Fare_p are fare levels after an expansion with and without frequency effects, respectively. Pax_1 and Pax_2 are numbers of passengers before and after an expansion. Green areas represent consumer surplus. Grey areas represent producer surplus. Striped grey and green areas represent a transfer of surplus from producers to users with the expansion.

Source: Oxera.

The figure illustrates the impact of frequency effects as an outward shift of the demand curve, which implies an increased demand at all fare levels, as airlines will provide more services to increase frequencies. Before an expansion, the market is at an equilibrium with fare level Fare_1 and number of passengers Pax_1. In this base case, the following areas characterise user surplus (US) and provider surplus (PS):

- $\text{US}_{\text{base}} = A$
- $\text{PS}_{\text{base}} = B + C + D$
- Total $\text{surplus}_{\text{base}} = \text{A} + B + C + D$

After the expansion, if there are no frequency effects, the market is at an equilibrium at price level $Fare_p$ and number of passengers Pax_2. Total benefits without frequency effects are therefore:

- $\text{US}_\text{p} = A + B + C + E + F$
- $\text{PS}_\text{p} = D + G$
- Total $\text{surplus}_\text{p} = A + B + C + D + E + F + G$

If frequency effects are accounted for, the market is at an equilibrium at price level $Fare_f$, which is higher than $Fare_p$. The total benefits after the expansion become:

- $\text{US}_\text{f} = A + B + E + H$
- $\text{PS}_\text{f} = C + D + F + G + I$
- Total $\text{surplus}_\text{f} = A + B + C + \text{D} + E + F + G + H + \text{I}$

These values indicate that, as a result of a capacity expansion, total benefits increase by $E + F + G$ if frequency effects are not accounted for, and by $E + F + G + H + I$ if frequency effects are accounted for. The omission of frequency effects therefore yields a conservative estimate of total benefits by $H + I$.

Source: Oxera.

Benefits and losses through changes in travel times

4.62 In addition to benefits arising from changes in fare levels, the dual runway operations facilitated by the Project would lead to operational changes on landing and departure. As a result, passengers may receive additional benefits through reductions in journey times. Gatwick Airport has provided us with the expected effect of the Project on taxi times, as presented in the table below.[91]

Table 4.8 Change in expected taxi time with the Project relative to taxi time in the Baseline (minutes)

	2029	2047
Departure	-6.2	-3.2
Arrival	-0.8	0.3

Note: Arrival time includes airborne holding time in addition to taxi time. Taxi times are linearly interpolated between available years, and are assumed to be constant after 2047. The estimates were provided only for the opening year and the year in which passenger demand is stabilised at the airport, and only these years are therefore presented in the table.

Source: GAL.

4.63 We quantify the benefits of these changes using the value of travel time for leisure and business passengers.[92]

4C.6 Calculate the user and provider benefits of the Project

4.64 Table 4.9 summarises the present values of the estimated benefits and losses to users and providers of the London aviation market for different estimated price floors.[93] The benefits are split between leisure and business users and are presented for different assumptions on the definition of 'price floor', as discussed in section 4C.4.

Table 4.9 Total benefits to users and providers in the London aviation system (£bn)

Proportion of other costs included in the price floor	**75%**	**50%**	**25%**
Leisure passenger benefits—fare effects	20.3	20.3	20.3
Leisure passenger benefits—travel time	0.2	0.2	0.2
Business passenger benefits—fare effects	39.5	57.4	58.1
Business passenger benefits—travel time	0.1	0.1	0.1
Total user benefits	**60.1**	**78.1**	**78.8**
Airline benefits	-55.2	-69.1	-66.9
Change in airport revenues	2.4	2.4	2.4
Total provider benefits	**-52.8**	**-66.7**	**-64.5**
Present value of benefits to users and providers	**7.3**	**11.3**	**14.3**

Note: All values are in discounted 2010 real prices. Numbers may not sum due to rounding. International-to-international transfer passengers have been excluded from the passenger numbers and the surplus calculations. Benefits to existing passengers are the additional value to air passengers from air travel who travel at lower fares with the Project. Benefits to new passengers are the difference between the maximum amount that passengers would be willing

[91] No material change in other components of a passenger's travel time, such as the time for the passenger's journey through the airport, is expected with the Project.
[92] We source values of time for business and leisure passengers from Department for Transport (2020), 'TAG Data Book Annual Parameters', July. For business passengers, we use the average value of time in market prices. Taxi times are linearly interpolated between available years, and are assumed to be constant after 2047.
[93] Discount rates of 3.5% for the first 30 years and 3.0% for the remaining years are used as per the guidance of HM Treasury (2018), 'The Green Book Central Government Guidance on Appraisal and Evaluation', p. 105.

to pay and the actual price that they pay for aviation services. Business and leisure passenger benefits are sums of benefits to existing and new passengers in each market. Fare effects refer to benefits from reduced fares. Travel time effects refer to benefits from reduced average travel times. Airline benefits reflect a welfare transfer from airlines to passengers with the Project and reflect the reduction in benefits that airlines would receive from providing their services beyond the costs of providing them (including their normal profits) due to capacity constraints. Change in airport revenues is at the London level and includes potential substitution between London airports. Time benefits are at Gatwick Airport level. We discuss competition between London airports in section 4G. As discussed in section 4C.4, we use various assumptions to identify the level of minimum prices that airlines may offer to ensure that prices are above predicted costs (i.e. price floors). Columns 2–4 of the table illustrate the Project's expected impact on the users and providers at each of these assumptions.

Source: Oxera.

4.65 We estimate that the Project would generate an additional value to users and providers of the London aviation system valued at £7.3bn to £14.3bn. We estimate the benefits to existing and new users of the London aviation system at £60.1bn to £78.8bn. As a result of falling shadow costs, we estimate a welfare transfer from airlines to passengers of £55.2bn to £66.9bn when 75% and 25% of other costs are included in the estimated price floors respectively.[94] Due to an increase in air traffic, airports are projected to earn higher revenues valued at £2.4bn.[95]

4C.7 Sensitivity of estimated user and provider benefits

4.66 In our core analysis, we have used various parameters to estimate the benefits arising from the Project to users and providers of aviation services in the London aviation system. In this section, we test the sensitivity of our results to these parameters in order to assess the robustness of the level of benefits that we have estimated. We also present the sensitivity of the estimated user and provider benefits to traffic forecasts by using an alternative scenario with slower growth in passenger demand in Appendix A7.

Sensitivity to price elasticities

4.67 The price elasticity of demand for aviation services is a key element that links passenger forecasts to fare forecasts between scenarios. It is therefore a crucial component of quantifying the benefits of the Project. However, depending on the aviation market and passenger types, passengers' responses may vary significantly. As such, we consider it prudent to conduct a sensitivity test by varying these assumptions.

4.68 Our alternative elasticities are sourced from the DfT's UK aviation forecasts, and are shown in Table 4.10.[96]

Table 4.10 DfT demand elasticities of air fares

Business	Leisure	Domestic
-0.2	-0.7	-0.5

Note: Business and leisure elasticities represent averages for short-haul and long-haul passengers. The domestic elasticity represents the average for domestic business and leisure passengers.

Source: Department for Transport (2017), 'UK Aviation Forecasts Moving Britain Ahead', October.

[94] Airlines would continue to profit from their operations through normal profits. Negative airline benefits represent lower profits with the Project relative to the Baseline scenario and arise from the reduction in the shadow costs of capacity constraints on air fares.
[95] This value is net of reduced revenue at the other London airports due to switching passengers.
[96] Department for Transport (2017), 'UK Aviation Forecasts Moving Britain Ahead', October, p. 22.

4.69 The DfT, and the meta-study used in our core results, suggest that business passenger demand is inelastic to changes in prices.[97] However, the DfT's elasticities suggest that leisure and domestic passenger demand is also price-inelastic, whereas the meta-study argues the opposite.[98] Table 4.11 presents the benefits arising from reduced fares with the Project using the DfT's elasticities.

Table 4.11 Sensitivity to elasticities—user and provider benefits (£bn)

Leisure passenger benefits—fare effects	33.5
Business passenger benefits—fare effects	44.1 – 97.8
Total user benefits—fare effects	**77.6 – 131.3**
Airline benefits	-73.0 – -117.8
Total—fare effects	**4.6 – 13.5**
Present value of benefits to users and providers (including time benefits and change in airport revenues)	**7.3 – 16.2**

Note: All values are in 2010 prices and values. Values may not sum due to rounding. International-to-international transfer passengers have been excluded from the passenger numbers and the surplus calculations. Travel time effects and airport revenues are not reported, as changes in price elasticities for a given set of traffic forecasts do not affect these values. Benefit ranges represent benefits when 75% and 25% of other costs are included in minimum fares.

Source: Oxera.

4.70 Our sensitivity set of elasticities suggests that the Project would generate benefits valued at £7.3bn to £16.2bn, compared with the same benefits valued at £7.3bn to £14.3bn in our core analysis.

Sensitivity to using different elasticities instead of a price floor

4.71 In section 4C.4, we have discussed that, to make the forecast passenger demand and price internally consistent, the use of a price floor is required to prevent airlines from setting average fares below their average cost levels. This may arise if, in some passenger markets, expected changes in demand between scenarios are strong but the demand response of passengers to changes in prices is weak. This would result in large changes in prices to rationalise the changes in demand.

4.72 An alternative to setting price floors would be identifying elasticity levels at which implied prices are no longer below known cost levels.[99] Therefore, we examine what price elasticities would need to be for this price floor to not apply in any market segment. Table 4.12 illustrates the closest elasticities to our baseline elasticities that ensure that implied fares are always above costs in our scenarios.

Table 4.12 Elasticities required to rationalise changes in demand with implied fares above costs

	Base elasticity	Sensitivity elasticity
Short-haul Business	-0.70	-0.80
Long-haul Business	-0.27	-0.77

Note: Elasticities in the other passenger markets are used as they are presented in Table 4.4, as predicted prices are never below price floors in those scenarios.

[97] A 1% change in air fares causes a less than 1% change in demand.
[98] A 1% change in air fares causes a more than 1% change in demand.
[99] This would be the sum of fuel, carbon, and normal profits, as the proportion of 'other costs' is unknown.

Source: Oxera.

4.73 Table 4.13 below illustrates the benefits estimated using these elasticities.

Table 4.13 Sensitivity to higher price responses by short- and long-haul business passengers—user and provider benefits (£bn)

Leisure passenger benefits—fare effects	20.3
Business passenger benefits—fare effects	25.2
Total user benefits—fare effects	**45.5**
Airline benefits	-32.8
Total—fare effects	**12.7**
Present value of benefits to users and providers (including time benefits and change in airport revenues)	**15.5**

Note: All values are in 2010 prices and values. Values may not sum due to rounding. International-to-international transfer passengers have been excluded from the passenger numbers and the surplus calculations. Travel time effects and airport revenues are not reported, as changes in price elasticities for a given set of traffic forecasts do not affect these values.

Source: Oxera.

4.74 This sensitivity suggests that the Project would generate benefits valued at £15.5bn, compared with the same benefits valued at £7.3bn to £14.3bn in our core analysis.

Sensitivity to the level of normal profit

4.75 Normal profits refer to profits that airlines would earn in competitive market conditions in which sufficient capacity is made available to meet underlying demand. In our main analysis, this is assumed to be constant at 2% of turnover. In this section, for illustration, we test the impact of a higher normal profit level, 5% of turnover, on the estimated impact of the Project.

4.76 A higher normal profit level means that the minimum price that the airlines would need to set to offer their services to passengers would be higher in this sensitivity than in our main analysis. This would have the following impact on the benefits that accrue to the users and providers of aviation services:

- lower user benefits in some markets, as prices with the Project would be higher and there would therefore be a reduced welfare transfer from airlines to existing air passengers;
- higher airline benefits, or less loss, as the welfare transfer from airlines to passengers is lower, as airlines can offer higher prices;
- the total impact on the user and provider benefits would depend on the magnitudes of these two effects.

4.77 Table 4.14 below illustrates the estimated benefits affected by this sensitivity. Other estimated benefits would be identical to those reported in Table 4.9, as they are not affected by the change in normal profits. These results suggest that, in the event that airlines would be able to maintain a 5% profit margin compared with a 2% profit margin as assumed in our main analysis, the Project would yield £8.9bn to £16.2bn benefits to users and providers of aviation services in the London aviation system, compared with £7.3bn to £14.3bn benefits estimated in our main analysis. That is, if airlines were to make a 5% profit on turnover instead of 2%, the benefits from the Project would increase mostly for providers, as they would be able to charge higher prices than in our

main analysis and attain the same passenger levels in some passenger segments. This would reduce the Project's impact on some passenger segments, as they would need to pay higher prices to access aviation services. However, the total impact of the Project is estimated to be higher.

Table 4.14 Sensitivity to higher normal profits—user and provider benefits (£bn)

Business passenger benefits—fare effects	38.6 – 58.1
Total user benefits (including time benefits)	**59.2 – 78.8**
Airline benefits	-52.8 – -65.0
Total provider benefits (including change in airport revenues)	**-50.4 – -62.6**
Present value of benefits to users and providers (including time benefits and change in airport revenues)	**8.9 – 16.2**

Note: All values are in 2010 prices and values. Values may not sum due to rounding. International-to-international transfer passengers have been excluded from the passenger numbers and the surplus calculations. Benefit ranges represent benefits when 75% and 25% of other costs are included in minimum fares.

Source: Oxera.

4D Wider economic impacts

4.78 Wider economic impacts of a transport scheme are impacts that accrue to people and businesses beyond the users and providers of the transport network.

4.79 The DfT's appraisal framework sets out methodologies for appraising the wider economic impacts of transport schemes.[100] According to this guidance, such benefits (and costs) may be due to:

- induced investments;
- marginal external costs;
- employment effects;
- productivity impacts;
- increased trade, FDI and tourism.

4.80 DfT guidance explains that wider economic impacts of a transport scheme can arise as increased connectivity of businesses is likely to result in benefits outside of the transport market.[101] By increasing global connectivity, an aviation scheme may result in:

- new opportunities to access knowledge, and reduced international transport costs, which can reduce production costs;[102]
- increased attractiveness of the area around the airport for businesses that benefit from international connections;[103]

[100] Department for Transport (2018), 'TAG Unit A2.1 Wider Economic Impacts Appraisal', May.
[101] Department for Transport (2018), 'TAG Unit A2.1 Wider Economic Impacts Appraisal', May, p. 1.
[102] This would be expected to influence production costs in imperfectly competitive markets. For example, see Airports Commission (2015), 'Economy: Wider Impacts Assessment', July, pp. 7.
[103] These opportunities would attract firms in similar industries, resulting in increased agglomeration. For example, see Airports Commission (2015), 'Economy: Wider Impacts Assessment', July, pp. 6–7.

- additional revenue to the government resulting from taxes on increased productivity and APD.[104]

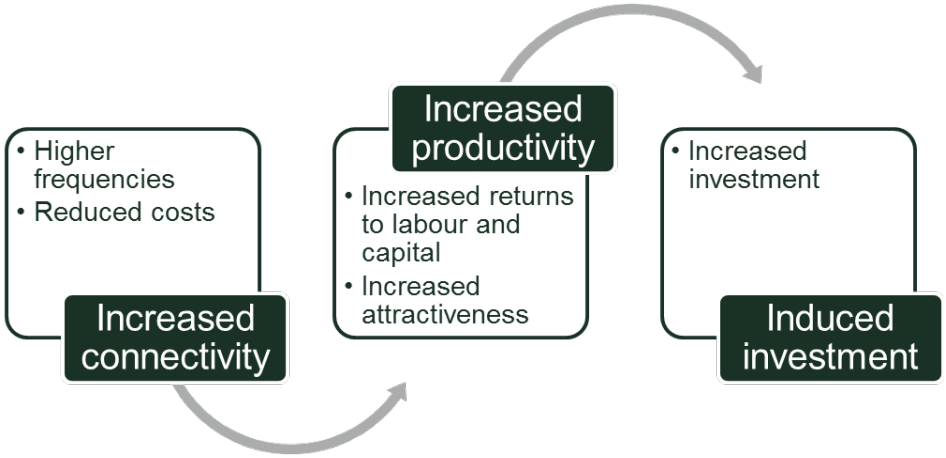
4.81 As passenger volumes at Gatwick Airport increase, there would be more traffic between Gatwick Airport and its surrounding area. This would result in additional external costs—for example, due to increased congestion.[105]

4.82 Below, we further discuss the mechanisms through which the Project may generate impacts above and beyond its impacts on air passengers, airlines and airports; quantify the benefits and costs arising from the factors discussed above; and qualitatively discuss other impacts that the Project may have on the wider economy.

4D.1 Induced investments

4.83 Induced investments refer to changes in investment in a region with the transport scheme. For example, an improved transport network may increase the connectivity of a region and reduce travel costs. As a result, firms may decide to invest more in that region. This change in behaviour is caused by the increased economic attractiveness of the region: increased connectivity enables higher productivity by reducing the time and financial costs associated with factors of production, such as workers' travel times, meaning that a particular level of output can be produced at lower cost. This mechanism is illustrated in Figure 4.7.

Figure 4.7 Effects of a transport scheme on investment behaviour



Source: Oxera.

4.84 Benefits arising from induced investment are captured by changes in the purpose and intensity of land use, which are measures of how the level and location of economic activity change with a project.[106] If there were no market failures—i.e. if an economy were functioning efficiently—changes in land use due to a transport investment would be minimal because an efficient distribution of economic activity at a national level would have already been achieved. If a market failure exists, additional benefits arise to the degree that the transport investment interacts with market distortions. One such market failure is imperfect competition.

[104] With new job opportunities, some individuals in the labour market may find positions with higher productivity, or their existing positions may become more productive, resulting in increased tax revenue.
[105] Department for Transport (2020), 'TAG Unit A5-4 Marginal External Costs', May.
[106] Department for Transport (2020), 'TAG Unit A2.2 Appraisal of Induced Investment Impacts', May.

Output change in imperfectly competitive markets

4.85 A transport scheme would make it easier to transport goods and services, reduce travel times for business passengers, and provide those business passengers with new business opportunities. The impacts of an aviation scheme could be particularly strong, as such a scheme increases not only local but also international connectivity with economic centres at long distances.

4.86 Alleviating capacity constraints and increasing such international connectivity allows businesses to benefit from reduced transport costs.[107] In competitive markets, cost reductions arising from increased connectivity with the Project would result in price reductions to consumers, and the benefits that firms obtain are already quantified in this appraisal as part of business user benefits in section 4C.

4.87 If product markets are not perfectly competitive, businesses can increase their output at their profit margins, which is an additional impact that is not captured by benefits through cost reductions due to the transport investment.[108]

4.88 The DfT recommends that this additional benefit to businesses is estimated using a simplified approach as a 10% uplift to business user benefits.[109] In section 4C.6, we estimate benefits to business passengers to be in the range of £39.5bn to £58.1bn. We therefore estimate the benefits from output increases in imperfectly competitive markets to range from £4bn to £5.8bn.

4D.2 Marginal external costs

4.89 The increased passenger volumes with the Project may result in costs borne by air passengers but also by all travellers on the surface access network around Gatwick Airport. Such costs are known as marginal external costs. For example, increased demand for aviation services at Gatwick Airport would result in increased traffic in the road network as more passengers will drive from and to Gatwick Airport.[110] This additional traffic would result in congestion for all travellers, including those who are using the transport network for reasons other than air travel.

4.90 We estimated the marginal external costs arising from the Project in line with TAG guidance.[111] Arup provided us with forecasts of vehicle kilometres (i.e. the total distance travelled by all vehicles) in the surface access network of Gatwick Airport in the Baseline and Project scenarios for 2029, 2032 and 2047. The TAG data book provides costs associated with a change in vehicle kilometres travelled.[112] We estimate that the marginal external costs arising from the Project would be £3.3m over the 60-year appraisal period.[113] Table

[107] As a result of reduced shadow costs in the aviation system.
[108] Department for Transport (2005), 'Transport, Wider Economic Benefits, and Impacts on GDP', Discussion Paper, July, p. 25; and Airports Commission (2015), Airports Commission (2015), 'Economy: Wider Impacts Assessment', July, pp. 19–20.
[109] Department for Transport (2020), 'TAG Unit A2.2 Appraisal of Induced Investment Impacts', May, p. 17. The uplift is estimated in Venables, A., Gasiorek, M., McGregor, P., Harris, R., Harris, R.I.D. and Davies, S. (1999), *The welfare implications of transport investments in the presence of market failure – The incidence of imperfect competition in UK sectors and regions*, DETR, October.
[110] An increase in trade and freight with the Project may also result in an increase in light and heavy goods vehicle traffic.
[111] Department for Transport (2020), 'TAG Unit A5.4 Marginal External Costs', May. Marginal external costs also include costs associated with changes in air quality, noise and GHGs. Since these impacts are appraised as part of the environmental impacts (see section 4E), we have excluded them from the calculation of the marginal external costs in order to avoid double-counting.
[112] Department for Transport (2020), 'TAG Data Book, MEC', July.
[113] Arup also provided us with the impact of a highway construction in 2029 on the change in vehicle kilometres with the Project. The impact of this on the overall marginal external costs is negligible.

4.15 below shows the breakdown of this cost, including additional tax revenues as a result of increased fuel use on the surface access network.

Table 4.15 Marginal external costs (£m)

Congestion	3.3
Infrastructure	0.0
Accident	0.0
Indirect Taxation	-0.0
Total	**3.3**

Note: Negative cost value in indirect taxation reflects benefits arising from increased tax revenue. Some figures round to zero.

Source: Oxera analysis.

4D.3 Employment effects

4.91 A transport investment increases the connectivity of a region. As a result, the same level of output can be produced with fewer resources, indicating an increase in returns to capital and labour.[114] Increased returns to labour may increase labour supply, as someone's labour becomes more valuable. Similarly, increased returns may change firms' demand for labour as they try to increase their outputs and achieve cost efficiencies at increased returns.

4.92 Increased returns may have different impacts on local and national employment levels. This is because employment effects at a national level arising from a transport scheme depend on the level of displacement—if a transport scheme causes a displacement of economic activity from one region to another, regions with an outflow of workers face a loss, whereas regions with an inflow of workers gain additional employment. The total welfare effect will depend on the difference between these gains and losses. Therefore, in general, even if a transport scheme increases employment at a local level, national impacts are observed only if the scheme induces a change to the national supply of labour. Such employment effects could occur through:

- better job matching;
- a change in the number of working hours;
- a reduction in inactivity.[115]

4.93 An expansion in airport capacity is unlikely to induce transport cost reductions in a way that leads to these effects at a national level.[116] We therefore do not expect the Project to have material supply-side employment effects that would generate employment impacts at a national level.[117]

4.94 However, the Project may still have an impact by increasing demand for labour in the vicinity of the airport. Demand-side employment effects arising from the Project (i.e. firms demanding more labour) may generate opportunities for existing workers by creating new positions—i.e. they may leave their current positions to start working at the new positions. The new positions may be more or less productive than the current positions. There would therefore be a positive (negative) employment impact arising from the Project if the new

[114] Department for Transport (2018), 'TAG Unit A2.1 Wider Economic Impacts Appraisal', May.
[115] Department for Transport (2019), 'TAG Unit A2.3 Employment Effects', May, p. 2.
[116] It is intended that the impacts of the scheme on local transport costs will be considered in the Economic Impact Report submitted in support of the Environmental Statement.
[117] Our analysis of local employment effects of the Project in section 5D.2 suggests a small incremental reduction in inactivity at a local level.

matching of workers with available positions results in a more (less) productive economy.

4.95 Our analysis of welfare effects arising from a move to more or less productive jobs considers jobs created only at the airport.[118] In order to quantify the welfare impact of such a move, we use estimates of labour supply impacts and differences in GVA per job between Gatwick Airport and the South East on average for 2029, 2032, 2038 and 2047.[119] Our analysis suggests that the Project would yield a present value productivity impact of £0.2bn in terms of GVA from moves to more productive jobs.[120] This procedure is described in detail in section 5D.3.

4.96 Some of this productivity improvement may be offset by losses due to effects such as changes in commuting time. However, the tax revenues from changes in productivity would be entirely additional, since these are not part of an individual's decision to take a particular job.[121] We estimate the welfare benefits of switches to more productive jobs, as tax benefits from increased GVA, with the Project as £0.1bn.

4D.4 Productivity impacts

4.97 The above section discusses how a productivity externality from the Project can occur if workers switch to more productive jobs offered at Gatwick Airport.

4.98 In addition to providing opportunities for switching to more productive jobs, the Project could have impacts on productivity, holding the employment mix constant. Such impacts arise as a result of increased concentration of economic activity at a particular location—firms can draw from a larger pool of labour and are located closer together, resulting in a greater exchange of ideas and technological spillovers.[122] These types of productivity benefit arising from locating in close proximity to other individuals and firms are called 'agglomeration'.[123]

4.99 The increase in airport activity with the Project is expected to increase economic activity at the airport and in the airport's vicinity. Overall, these effects would increase the density of economic activity, not just in airport-related jobs but also in sectors that are attracted to the area around the airport, which would in turn generate agglomeration effects. These benefits can be quantified using elasticities of productivity with respect to a measure of effective employment density.[124] Our methodology for estimating agglomeration effects is based on the DfT's TAG, and is described in Box 4.4.

[118] We exclude catalytic and indirect jobs due to a lack of evidence on the productivity differentials between existing and new jobs for these types of employment effect.
[119] This implies that, for a worker switching to a new job at Gatwick Airport with the Project, the GVA of the old job is the average GVA in the South East, and the GVA of the new job is the average GVA at Gatwick Airport.
[120] We interpolate productivity impacts between modelled years linearly, and assume a real GVA increase after the last modelled year until the end of our appraisal period. We source real productivity growth rates from Department for Transport (2020), 'TAG Data Book Annual Parameters', July.
[121] Department for Transport (2019), 'TAG Unit A2.3 Employment Effects', May, p. 13. The tax rate is assumed to be 30%, as per the guidance of the TAG Unit.
[122] Banister, D. and Berechman, J. (2000), *Transport investment and economic development*, Routledge, p. 95.
[123] Our appraisal does not consider a potential impact of work-from-home schemes, which may be more prominent in the future, on how agglomeration affects productivity, due to absence of evidence.
[124] Venables, A.J. (2004), 'Evaluating Urban Transport Improvements: Cost-Benefit Analysis in the Presence of Agglomeration and Income Taxation', Centre for Economic Performance Discussion Paper No 651.

Box 4.4 Methodology for estimating agglomeration effects

Agglomeration effects are calculated based on a measure of the density of employment in a study area with one or more geographic units. This 'effective density' is defined as follows:

$$ED_i = \frac{E_i}{\sqrt{A_i/\pi}} + \sum_{j \neq i} \frac{E_j}{d_{ij}}$$

where E_i is total employment in region i, A_i is the area of region i, and d_{ij} is the distance between regions i and j.

This measure of effective density is different from the recommended measure in the relevant section of the DfT's appraisal guidance cited above. This is because the DfT recommendation focuses on appraising agglomeration benefits from rail and road schemes, which affect the generalised cost of travel between regions. However, as commuting via air travel is unlikely, impacts of aviation schemes occur through different channels. Assuming that the related surface access investments accommodate only the increase in passenger numbers, aviation schemes are unlikely to have a material impact on the cost of travel between regions. Instead, they increase density in a given geographic region by providing additional jobs through direct, indirect and catalytic effects. These employment effects are discussed in section 5D.2. Our measure of effective density is sourced from Graham (2007),[125] and takes into account changes in employment at a given geographic location, and, if there are multiple locations, distances between them.

We calculate effective densities for the Baseline and Project scenarios and use the following formula to assess the agglomeration benefits of the Project:

$$\text{Agglomeration benefit}_i = \left[\left(\frac{ED_i^{Project}}{ED_i^{Baseline}}\right)^{\in} - 1\right] \times GDP\ per\ worker_i \times E_i^{Baseline}$$

where $E_i^{Baseline}$ is the baseline employment in region i, $\in$ is the elasticity of output with respect to changes in agglomeration, $GDP\ per\ worker$ is the baseline GDP per worker in region i, and EDs are effective densities of the Baseline and Project scenarios as calculated above.[126]

Source: Oxera.

4.100 We calculate agglomeration benefits using our largest study area, the Five Authorities, to capture a geographic definition that is representative of Gatwick Airport's economic significance in the South East.[127] Our analysis indicates that the Project is expected to bring almost 13,000 additional jobs to the region by 2047.[128] We estimate that this increase in employment would result in agglomeration benefits valued at £0.7bn.[129] This estimate should be treated as indicative of the potential agglomeration benefits arising from the Project, because three additional effects could influence its size.

4.101 First, our estimate does not take into account a potential loss of density outside of the Five Authorities study area. If increased density in an area is caused by migration of jobs or workers from other locations, increased density in our study area may imply a loss of density in other regions. The extent of this loss of density and its impact on productivity in other regions depend on how

[125] Graham, D.J. (2007), 'Agglomeration, productivity and transport investment', *Journal of Transport Economics and Policy*, **41**:3, September.
[126] This formula is sourced from Department for Transport (2020), 'TAG Unit A2.4 Appraisal of Productivity Impacts', May.
[127] We analyse the impact of the Project on employment in the Five Authorities area in section 5D.2.
[128] This is an estimate of the labour supply and net catalytic jobs attributable to the Five Authorities study area.
[129] Estimates are in 2010 prices and values. We assume an agglomeration elasticity of 0.03725, which is the mean of manufacturing and service elasticities as reported in Department for Transport (2020), 'Wider Impacts Dataset', July. A study by Cambridge Econometrics is used for employment forecasts in the Five Authorities study area. Values for GDP per worker are sourced from Department for Transport (2020), 'Wider Impacts Dataset', July. GDP per worker in the Five Authorities study area is calculated as the average GDP per worker in the manufacturing and services sectors in the LADs in the Five Authorities study area.

dispersed the origin of displacement is. For example, if the origin of migration into the region is not a particular area but many areas across the UK, reductions in the effective density of outside regions may not be material compared with the increase at the study region. On the other hand, if all displacement is from a particular region, there could be a relatively large loss of density. In any event, excluding reduced effective density at non-study regions results in an overestimate of benefits from agglomeration at a national level.

4.102 Second, our estimate uses a large geographic unit that is an aggregate of five authorities. As a result, we do not quantify agglomeration benefits that would arise from switching jobs within the study area. For example, if labour becomes concentrated within a particular region of our study area, even if there were no net increase in the aggregate employment in the Five Authorities area, we could observe increased agglomeration due to increased concentration of labour within particular regions of the area. As a result, excluding this effect might lead to an underestimate.[130]

4.103 Third, our estimate of agglomeration benefits is calculated using only benefits to existing jobs in the region, and therefore excludes potentially increased productivity of new jobs with the Project as a result of increased agglomeration. We choose to exclude this effect to avoid double-counting increased productivity benefits with the Project. An individual's decision to become employed in the region with the Project would depend on the overall increase in the individual's productivity, which would include the expected productivity increase from agglomeration. We discuss how a perceived increase in labour productivity affects supply and demand for employment in section 4D.3. In the event that there are still additional productivity impacts arising from increased agglomeration for the new jobs, our analysis excludes these benefits.[131] This exclusion would result in an underestimate.

4D.5 Impacts on public accounts

4.104 Increased activity at Gatwick Airport would have direct and indirect impacts on public accounts by affecting tax revenues. Tax receipts from aviation would increase as more passengers travel from Gatwick Airport. This effect is offset by a fall in passengers' disposable income and a resulting decrease in consumers' taxable spending elsewhere in the economy. As a result of this indirect impact, tax receipts fall. This effect is not captured as part of the benefits discussed in the earlier sections of this appraisal.

4.105 The government levies APD on all flights by all departing passengers from the UK. We are aware that there is an ongoing consultation by the government on aviation tax reform[132]—however, we have assumed no changes from the current announced rates.[133]

4.106 APD is passed on to air fares, and therefore affects the amount of disposable income of leisure passengers. As a result, estimates of tax revenues should

[130] Fully characterising benefits arising from internal movements would require more granular estimates of net employment impacts arising from the Project, which would require additional assumptions on the distribution of employment that we have not imposed on our estimates.
[131] This would occur, for example, if it were known that some additional workers who start to work in the area with the Project would have chosen to work in the region even if there were no benefits from agglomeration.
[132] HM Treasury (2021), 'Aviation tax reform: consultation', March, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971943/Aviation_Tax_Reform_Consultation.pdf, accessed 5 May 2021.
[133] The APD rates used in our estimations are currently announced rates applied from 1 April 2022. For more information, see HM Government (2018), 'Rates for Air Passenger Duty', 29 January, https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty, accessed 5 May 2021.

account for the reduced taxable spending by leisure passengers. Thus, we use different formulas for business and leisure passengers to estimate the tax impacts of the Project. For business passengers, we use:

$$(1+t) \times \sum \left(n^{B}_{Project} \times APD^{B}_{Project} - n^{B}_{Baseline} \times APD^{B}_{Baseline} \right)$$

and for leisure passengers, we use a similar formula corrected for the reduction in disposable income:

$$(1+t) \times \sum \left(n^{L}_{Project} \times APD^{L}_{Project} - n^{L}_{Baseline} \times APD^{L}_{Baseline} \right) - t \times \left(fare^{L}_{Project} \times n^{L_{UK}}_{Project} - fare^{L}_{Baseline} \times n^{L_{UK}}_{Baseline} \right)$$

4.107 where t is an indirect tax correction, and n is the number of business (B) and leisure (L) passengers in the Baseline and Project scenarios.[134] Table 4.16 summarises the estimated increase in indirect tax revenues with the Project.

Table 4.16 Change in indirect tax revenues: APD (£bn)

From business passengers	1.0
From leisure passengers	3.7
Total	**4.7**

Note: Estimates are in 2010 prices and values. They may not sum due to rounding. Real APD rates are assumed to be constant over time.

Source: Oxera.

4.108 The Project may also have an impact on other types of indirect taxes. For example, increased demand at Gatwick Airport would increase revenue from fuel duty, fuel VAT, rail franchises, or national non-domestic rates (NNDR). Such effects will be additional to the benefits quantified in this appraisal only if they do not displace other taxable spending in the UK. We do not quantify these benefits in the absence of evidence on how passengers' transport choices would change with the Project.

4D.6 Tourism

4.109 For many international travellers, aviation is the only feasible way to reach their destination.

4.110 Reduced fares and increased services reduce (generalised) travel costs, enabling passengers to travel abroad to see new places and visit their friends and relatives more frequently, which results in welfare benefits.[135] Incremental welfare benefits that the Project would provide through these effects are measured in section 4C as a part of user benefits. We calculate the additional tax benefits resulting from changes in the number of air passengers, including tourists, in section 4D.5.

4.111 The increased connectivity resulting from greater runway capacity could facilitate tourism activity, for example through expenditure during a visit.[136] It is important to recognise that an improvement in aviation services could facilitate

[134] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May, p. 8. The subscript UK refers to the UK subset of leisure passengers. Only departing passengers are considered. Our analysis uses new APD rates sourced from HM Government, 'Rates for Air Passenger Duty', https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty, accessed 4 May 2021.
[135] Airports Commission (2013), 'Discussion Paper 02: Aviation Connectivity and the Economy', March.
[136] See, for example, Oxford Economics (2017), 'The economic impact of Gatwick airport', January, pp. 19–20.

both inbound tourism (to the UK) and outbound tourism (from the UK). A 2018 study for the Gatwick Growth Board estimated that there is a significant level of spending in the UK associated with tourists transiting through Gatwick Airport.[137]

4.112 At a national level, for such activities to generate welfare benefits that are additional to the benefits assessed in this appraisal elsewhere, they should alleviate market failures or increase productivity as discussed in the sections above. As such, in the absence of evidence on how tourism could provide such impacts on the UK economy, we do not quantify any explicit wider economic impacts arising from increased tourism at this stage.[138]

4D.7 Trade and foreign direct investment

4.113 Aviation is a strong driver of trade and FDI. It facilitates international engagements by generating trade links and investment opportunities.[139]

4.114 Aviation's impact on FDI and firms' trade decisions is a result of the connectivity it provides. Increased connectivity reduces the costs of face-to-face interactions and increases their frequency, resulting in reduced organisational and communication costs within and between multinational firms.[140] Cost reductions resulting from the increased connectivity of a geography are therefore influential on international investment decisions.[141]

4.115 Within the scope of an aviation appraisal, the wider benefits from increased FDI and trade arise through their effects on productivity.[142] The long-run mechanisms linking increased trade and FDI to productivity are argued to be technological spillovers and transmission of know-how—they affect economies through similar channels.[143] Trade and FDI may also be linked, for example if extra trade requires investment before it is achieved.

4.116 Since these benefits accrue to society through the same channels, it is often difficult to distinguish trade benefits from FDI benefits. A study by PwC conducted for the Airports Commission explores the impact of FDI and trade on productivity using trade as a proxy. The analysis concludes that increased trade is associated with increased connectivity, with a 1% increase in the number of air passengers in the UK affecting:

- goods export by 0.24%;
- good import by 0.58%;

[137] Oxford Economics (2018), 'Gatwick Airport's impact on the visitor economy', February.
[138] We are considering whether further analysis on this aspect could be conducted for inclusion in the Economic Impact Report submitted in support of the Environmental Statement.
[139] Bannò, M. and Redondi, R. (2014), 'Air connectivity and foreign direct investments: economic effects of the introduction of new routes', *European Transport Research* Review, **6**:4, pp. 355–63. Peak Economics (2018), 'Wider Economic Impacts of Regional Air Connectivity', report to the Department for Transport, November.
[140] McCann, P. (2009), 'Globalisation and Economic Geography: The World is Curved, Not Flat', *Cambridge Journal of Regions, Economy, and Society*, **1**:3, June, pp. 351–370.
[141] For example, Bel and Fageda (2008) shows that the supply of intercontinental flights is associated with corporate headquarter location decisions. Bel, G. and Fageda, X. (2008), 'Getting there fast: Globalisation, intercontinental flights and location of headquarters', *Journal of Economic Geography*, **8**:4, February, pp. 471–495. Our appraisal does not consider a potential impact of an increased proportion of remote meetings in the future absent evidence on the long-term behavioural impact of increased work-from-home schemes globally.
[142] This is the effect of increased FDI and trade. The other impacts of factors that arise from alleviating capacity constraints and cause an increase in FDI and trade are already quantified elsewhere in this appraisal. For example, reduced shadow costs may result in more trade, and its impact on businesses is a part of business user benefits.
[143] Nordås, H., Mirodout, S. and Kowalski, P. (2006), 'Dynamic Gains from Trade', OECD Trade Policy Papers, No: 43, November.

- services export by 0.25%.[144]

4.117 Increased trade results in increased productivity, GVA, and additional tax benefits at a national level.[145] This suggests that the increased connectivity and activity at Gatwick Airport with the Project would be associated with an increased likelihood of inward FDI and increased volume of trade.

4.118 Despite the well-established theoretical understanding of how FDI and trade would affect the economy, and the fact that the wider literature supports the existence of this positive association, empirical causal links are difficult to find.[146] Therefore, we do not quantify the productivity benefits that may arise with the Project through increased trade and FDI.

4D.8 Total benefits to passengers and the wider economy

4.119 So far, we have quantified benefits arising from the Project to users and providers of the aviation market and analysed the impacts of the Project on the wider economy. Table 4.17 summarises our analysis so far in terms of the benefits to passengers, producers, the wider economy, and government arising from the Project over the 60-year appraisal period.

Table 4.17 Total benefits to passengers, producers and the wider economy (£bn)

Passenger benefits	**60.1 – 78.8**
Change in airport revenues	**2.4**
Wider economic benefits	**4.7 – 6.6**
• Output change in imperfectly competitive markets	4 – 5.8
• Marginal external costs	-0.0
• Move to more or less productive jobs	0.1
• Agglomeration benefits	0.7
Government revenues	**4.7**
Present value of benefits to passengers, producers and the wider economy	**72.0 – 92.5**

Note: All estimates are in 2010 prices and values. They may not sum due to rounding. Benefit ranges represent benefits when the 75% and 25% of other costs are included in minimum fares.

Source: Oxera.

[144] PwC (2013), 'Econometric analysis to develop evidence on the links between aviation and the economy', Final report, Airports Commission, December. Peer reviews of the PwC study argue that these relationships should be interpreted as associations only, as they do not fully account for underlying econometric problems. See Oxera (2015), 'Technical Report in response to Airports Commission Consultation', February. Department for Transport (2015), 'Review of the Airports Commission's Final Report', December. Laird, J.J. and Stroombergen, A. (2015), 'Airports Commission 2. Economy: Wider Impacts Assessment Peer Review', report to Gatwick Airport, March.

[145] Nordås, H., Mirodout, S. and Kowalski, P. (2006), 'Dynamic Gains from Trade', OECD Trade Policy Papers, No: 43, November. Alcala, F. and Ciccone, A. (2004), 'Trade and Productivity', *The Quarterly Journal of Economics*, **119**:2, May, pp. 613–646. Frankel, J.A. and Romer, D. (1999), 'Does Trade Cause Growth?', *American Economic Review*, **89**:3, June, pp. 379–399.

[146] Berg, A. and Krueger, A. (2003), 'Trade, Growth, and Poverty: A Selective Survey', IMF Working Paper WP/03/30, February. IATA (2016), 'Value of Air Cargo: Air Transport and Global Value Chains Final Report', December.

4E Environmental impacts

4.120 In this section, we consider the environmental impacts arising from increased activity at Gatwick Airport with the Project. The DfT's TAG provides detailed guidance on appraising a number of such impacts.[147] In particular, we consider:

- noise;
- air quality;
- GHG emissions.

4.121 As with the economic value assessments, we assess the Project's environmental impacts using the same Baseline and Project scenarios, in 2010 prices and values, and over a 60-year period after the Project's opening in addition to the costs incurred during the Project's development.

4E.1 Noise impacts

4.122 The increased activity at Gatwick Airport resulting from the Project would increase the noise footprint of the airport relative to the Baseline—specifically, in the vicinity of the airport itself, its flight paths, and surface access network.[148]

4.123 Increased noise would cause increased annoyance and sleep disturbance, and have adverse health effects on individuals.[149] The DfT's approach to appraising costs associated with these effects is based on the number of individuals exposed to particular noise bands during day and night. All else being equal, there would be a noise cost if a scheme results in some individuals becoming exposed to noise in higher noise bands.[150]

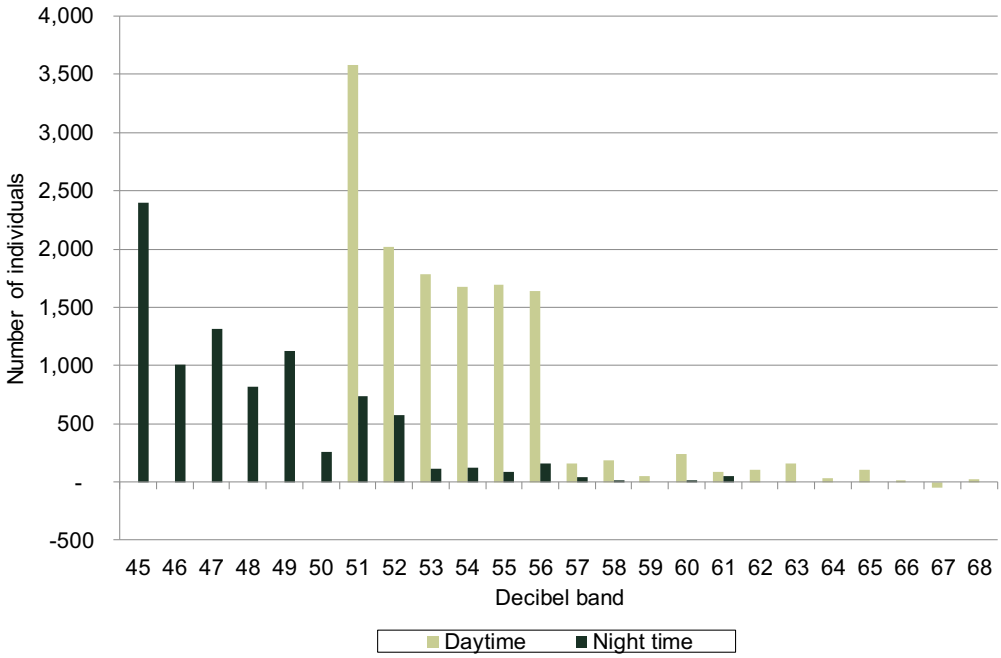
4.124 For noise from aviation, Civil Aviation Authority (CAA) guidance specifies the Lowest Observed Adverse Effect Level (LOAEL) as 51dB for daytime noise and 45dB for night time noise, and recommends using these metrics for assessing noise impacts.[151] We report an assessment of noise impacts arising from increased aviation activity with the Project following the CAA's guidance.[152]

4.125 To evaluate impacts of changes in aircraft noise levels with the Project, we have received forecasts of the number of individuals in each noise band

[147] Department for Transport (2021), 'TAG Unit A3 Environmental Impact Appraisal', May. The Project is expected to attract passengers from other London airports, as discussed in section 4G. This substitution may reduce the environmental costs associated with activity at these airports. Our analysis does not capture this reduction and focuses only on increased environmental costs in the vicinity of Gatwick Airport. In this sense, our assessment is a conservative estimate of the environmental costs of the Project at a national level.
[148] Due to changes in flight paths after the standby runway is enabled for routine use, there may be some individuals who are exposed to lower noise levels with the Project. However, there would be a net increase due to higher activity without a significant change in airspace design.
[149] Civil Aviation Authority (2016), 'Aircraft noise and health effects: Recent findings', March. These health impacts include heart attack, stroke, and dementia.
[150] Department for Environment, Food & Rural Affairs (2014), 'Environmental Noise: Valuing impacts on: sleep disturbance, annoyance, hypertension, productivity and quiet', November. dB refers to decibel and is a metric used to measure sound level. A higher decibel level means a higher sound level.
[151] Civil Aviation Authority (2017), 'Air navigation guidance 2017', October, p. 18. LOAEL is the level at which adverse effects of noise begin to be detected on a community. Daytime noise is defined as the average noise level for the period between 07.00 and 23.00 (LAeq16hr). Night time noise is defined as the average noise level for the period between 23.00 and 07.00 (LAeq8hr).
[152] Many individual factors determine which minimum noise level would cause adverse effects on all individuals. This motivates the use of a community-based LOAEL measure as suggested by the CAA. Empirical evidence suggests that such adverse effects at a community level start to be observed at 51dB for daytime and 45dB for night time noise. For more information see, for example, Civil Aviation Authority (2017), 'UK Airspace Policy: A framework for balanced decisions on the design and use of airspace', February, pp. 45–51. It is intended that this valuation will be expanded to include noise costs associated with increased activity on site and surface access for the Environmental Statement.

between 45dB and 81dB for the Baseline and Project scenarios.[153] Figure 4.8 illustrates the net change in numbers of individuals in each noise band. For daytime noise, most people switching noise bands are expected to be exposed to 51dB–56dB. For night time noise, most switchers are expected to be exposed to 45dB–52dB.[154]

Figure 4.8 Net increase in the number of individuals in each dB band



Note: Values at the x-axis indicate the lower end of the dB band—for example, 51 refers to the 51dB–52dB noise band. The negative value at 67dB means a reduction in the number of individuals exposed to this noise level. Estimates refer to changes in noise levels with the Project relative to the Baseline.

Source: CAA Environmental Research Consultancy Department (ERCD).

4.126 In addition to noise forecasts, we have received a valuation of the costs arising from increased aircraft noise relative to the baseline using the TAG approach for our 60-year appraisal period from CAA ERCD. This assessment suggests that the present value of noise cost of the Project is £10.7m. Table 4.18 presents a breakdown of this estimate into sleep disturbance, amenity, and health impacts.

[153] Noise modelling by the CAA ERDC was provided to Mitchell Environmental Ltd. See Chapter 14 ('Noise and Vibration') of the 'Preliminary Environmental Information Report'.
[154] Daytime figures correspond to the net increase in number of individuals exposed to noise levels between 51dB and 81dB, while night time figures refer to noise levels between 45dB and 81dB. Although there is a net increase in the number of individuals subject to most dB bands with the Project, it is estimated that some individuals may be subject to lower dB bands. For day and night, the vast majority of individuals who shift a band shift by 1dB. See Chapter 14 ('Noise and Vibration') of the 'Preliminary Environmental Information Report' for an assessment of these impacts.

Table 4.18 Present value of monetised impacts from increased aircraft noise (£m)

Sleep disturbance	3.5
Amenity	5.1
Acute myocardial infarction	0.0
Stroke	0.8
Dementia	1.2
Total	**10.7**

Note: Values are in 2010 prices and values. They may not sum due to rounding. Estimates refer to changes in noise levels with the Project relative to the Baseline.

Source: CAA ERCD.

4E.2 Air quality

4.127 The construction of the Project, increased flight frequencies, ground activity at the airport and increased traffic on the surface access network would generate additional NO_x and particulate matter ($PM_{2.5}$) emissions.[155] We value the social cost arising from changes in air quality with the Project compared with the baseline in line with TAG.[156]

4.128 Arup provided us with an assessment of changes in emission levels of these pollutants for the Baseline and Project scenarios for the opening year 2029 and the modelling years 2032 and 2038.[157]

4.129 The UK is legally committed to achieving emission targets for NO_x and $PM_{2.5}$ pollutants to improve air quality.[158] The TAG approach for assessing the costs of these emissions recommends different assessment approaches depending on whether emissions from a scheme would breach legal obligations on emission levels. We understand from Arup that its analysis does not suggest an exceedance of limit values in the opening and modelling years.[159] In these cases, the DfT guidance recommends two approaches to assessing the value of the Project's impact on air quality: damage costs, and impact pathways. In our assessment, we use the damage costs approach due to data limitations on the distribution of pollutants.[160]

4.130 The TAG damage costs approach to air quality valuation is based on annual emission levels of each pollutant with and without the Project. The values used in this approach account for the effects of changes in emission levels of

[155] NOx emissions are released when fuels are burned. PM emissions are released from various sources such as fuels, lubricants, and tyre and brake wear. These pollutants have adverse effects on health and the environment. See, for example, Department for Environment, Food & Rural Affairs (2019), 'Emissions of air pollutants in the UK, 1970 to 2017', February.
[156] Department for Transport (2021), 'TAG Unit A3 Environmental Impact Appraisal', May.
[157] Arup provided us with emissions figures associated with airfield construction for 2024 and emissions figures from the highway construction for 2029. We assume that emissions are constant until 2038 for the former and 2032 for the latter construction activity, in line with the anticipated construction start and end dates. See Chapter 5 ('Project Description') of the 'Preliminary Environmental Information Report'.
[158] European Commission (2016), 'Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC', *Official Journal of the European Union*, December. Department for Environment, Food & Rural Affairs (2019), 'Clean Air Strategy 2019', January sets out actions to meet these goals.
[159] Chapter 13 ('Air Quality') of the 'Preliminary Environmental Information Report'.
[160] The damage costs approach can be used to monetise the impact of changes in aggregate levels of pollutants without assumptions on how pollutants are geographically distributed. As such, it provides the average impact of the changes in emission levels in the UK. The impact pathways approach results in a more precise estimate of the social cost of changes in air quality, but it requires additional data on the distribution of emissions and affected population. For more information, see Department for Environment, Food & Rural Affairs (2021), 'Air quality appraisal: impact pathways approach', 26 March.

different pollutants.[161] The approach provides three sets of costs associated with changes in pollutant levels—a central scenario, and two sensitivities to reflect the uncertainties in the analysis.[162]

4.131 Using the central cost forecast, we estimate the present value of the cost of increased NO_x and $PM_{2.5}$ emissions with the Project to be £114.6m in 2010 prices and values. Table 4.19 presents a breakdown of this estimate into emissions from aircrafts and emissions on site and from surface access.

Table 4.19 Present value of monetised impacts of increased pollution (£m)—central scenario

	NO_x	$PM_{2.5}$	Total
Aircraft	97.1	10.8	**107.9**
On site, surface access, construction	0.7	6.0	**6.7**
Total	**97.8**	**16.8**	**114.6**

Note: Values are in 2010 prices and values. They may not sum due to rounding. Estimates refer to changes in pollutant levels with the Project relative to the Baseline.

Source: Oxera.

4.132 Costs in the low and high scenarios suggest that the monetised impact of changes in air quality with the Project would be in the range of £12.3m–£423.2m in 2010 prices and values.

4E.3 Greenhouse gas emissions

4.133 Aviation is a substantial source of GHG emissions. Increased activity with the Project relative to the baseline would (absent other, offsetting, changes) increase aviation's carbon footprint in the UK, making a valuation of increased GHG emissions important to our appraisal.

4.134 The UK is committed to reducing its carbon emissions to net zero by 2050.[163] This target is monitored through five-yearly carbon budgets.[164] According to the DfT's guidance, in addition to the cost of incremental GHG emissions with the Project, the Project's impact on carbon budgets should be reported.[165] This is discussed in Chapter 15 ('Climate Change and Carbon') of the 'Preliminary Environmental Information Report'.

4.135 According to the DfT guidance, economic appraisals should distinguish between emissions from traded and non-traded sectors.[166] Through the UK Emissions Trading Scheme (UK ETS), the traded sector purchases emission allowances, which sets a quota on the level of emissions for a given period. This mechanism creates a market for trading carbon allowances and sets a

[161] These effects include physical impacts of increased emissions on health, productivity, wellbeing and environment.
[162] Department for Environment, Food & Rural Affairs (2021), 'Air quality appraisal: damage cost guidance', 26 March. The damage costs approach accounts for the impacts of increased emissions on health, productivity, and wellbeing on the society. Sensitivities include different types and levels of impact of pollution. The low scenario includes well-established effects with low impacts. The central and high scenarios progressively add more effects with higher impacts, resulting in differences for the estimate of changes in air quality.
[163] HM Government, 'UK becomes first major economy to pass net zero emissions law', June, https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law, accessed 1 July 2021.
[164] Committee on Climate Change website, 'Advice on reducing the UK's emissions', https://www.theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/, accessed 1 July 2021.
[165] Department for Transport (2021), 'TAG Unit A3 Environmental Impact Appraisal', May, pp. 33–34.
[166] Department for Transport (2021), 'TAG Unit A3 Environmental Impact Appraisal', May. Traded sectors are defined as those sectors that are included in the UK ETS. This includes emissions from power and heat generation, European energy-intensive industries and aviation.

price for it, resulting in internalisation of the cost of carbon emissions in the prices of the traded sector goods. Emissions from the traded sector are therefore reported but not included in the environmental cost valuation.[167]

4.136 Arup produced forecasts of GHG emissions at Gatwick Airport and its surface access network for the Baseline and Project scenarios with a traded and non-traded sector breakdown.[168] The incremental traded sector emissions in 2038 are forecast to be 0.3m metric tonnes of CO_2 equivalent (CO_2e), and include emissions from domestic and European flights and emissions from on-site fuel use. The incremental non-traded sector emissions in 2038 are forecast to be 0.9m metric tonnes of CO_2e, and include emissions from other flights, other on-site activities, and the surface access network.[169] In addition to these values, forecast GHG emissions include a total of 1.5m metric tonnes of CO_2e from construction-related activities between 2023 and 2038.[170]

4.137 The approach suggested in TAG is based on using forecast prices per tonne of CO_2e emissions in the non-traded sector.[171] The DfT provides three carbon price scenarios to reflect uncertainties around the future determinants of carbon prices.

4.138 Using the central scenario, we estimate the cost of the increased emissions with the Project to be £2.0bn. As required by the DfT, Table 4.20 summarises a breakdown of this cost estimate for various carbon price scenarios, including the high price scenario.[172] These sensitivities suggest that costs from carbon emissions with the Project may range from £0.9bn to £3.1bn.

Table 4.20 Present value of monetised impacts of increased GHG emissions (£bn)

	Low scenario	Central scenario	High scenario
Aviation	0.8	1.7	2.7
Construction	0.0	0.1	0.1
Ground activities and surface access	0.1	0.2	0.3
Total	**0.9**	**2.0**	**3.1**

Note: Values are in 2010 prices and values. Estimates refer to changes in emission levels with the Project relative to the Baseline. Values may not sum due to rounding.

Source: Oxera.

4.139 We also received aviation emissions for a sensitivity scenario that assumes a 1.4% annual decrease in emissions between 2038 and 2050 due to increased efficiencies from technological advancements in aviation. We present the

[167] Department for Transport (2021), 'TAG Unit A3 Environmental Impact Appraisal', May, p. 28.
[168] See Chapter 15 ('Climate Change and Carbon') of the 'Preliminary Environmental Information Report' for details on the assessment of GHG emissions. We received the estimated traded and non-traded sector breakdown for the years 2018, 2029, and 2038. We also received further estimated traded sector emissions for the years between 2038 and 2050. We linearly interpolate emissions between the forecast years, and assume that emissions after 2038 for the non-traded sector and after 2050 for the traded sector are constant.
[169] Other operational activities refer to water supply, waste management, and other non-tradable energy use. Surface access network refers to emissions from airport-related traffic.
[170] Construction emissions include emissions from construction-related transportation, commuting, waste and water management, and material and energy use.
[171] The carbon prices that we use in this scenario are provided by the Department for Business, Energy & Industrial Strategy, and are sourced from Department for Transport (2020), 'TAG Data Book, A3.4 Greenhouse Gases', July.
[172] HM Government (2020), 'Forthcoming change: interim carbon values for scheme appraisal', July, https://www.gov.uk/government/publications/tag-forthcoming-changes-to-carbon-values/forthcoming-change-interim-carbon-values-for-scheme-appraisal, accessed 1 July 2021.

sensitivity of costs associated with aviation emissions in this scenario in the table below.

Table 4.21 Sensitivity scenario using more efficient aviation technologies

	Low scenario	Central scenario	High scenario
Aviation	0.7	1.7	2.6

Note: Values are in 2010 prices and values. Estimates refer to changes in emission levels with the Project relative to the Baseline.

Source: Oxera.

4E.4 Conclusion on environmental impacts

4.140 Increased air and ground traffic with the Project would result in environmental costs to UK society. We have estimated the present values of these costs by monetising changes in noise, air quality, and GHG emissions with the Project at £0.9bn–£3.5bn. Table 4.22 presents a summary of these costs.

Table 4.22 Present value of monetised environmental impacts of the Project (£bn)

Noise	0.0
Air quality	**0.0 – 0.4**
• Aircraft	0.0 – 0.4
• On site, surface access, and construction	0.0 – 0.0
GHG	**0.9 – 3.1**
• Aviation	0.8 – 2.7
• Construction	0.0 – 0.1
• Other activities and surface access	0.1 – 0.3
Total	**0.9 – 3.5**

Note: Values are in 2010 prices and values. Estimates refer to changes in emission levels with the Project relative to the Baseline. Values may not sum due to rounding. Ranges represent uncertainty in the monetary costs associated with GHG emissions.

Source: Oxera.

4F Net social benefits of the Project

4.141 Increased air traffic facilitated by the Project generates benefits to passengers, providers, the wider economy, and the government. These are offset to some extent by environmental costs. By subtracting the costs from the benefits it is possible to calculate the net social benefits, which are a cost–benefit metric regarding the social impacts of the Project.

4.142 The net social benefits of the Project are estimated at £13.3bn to £24.7bn. Table 4.23 presents a breakdown of these benefits.

Table 4.23 Net social benefits of the Project (£bn)

Total benefits to passengers, producers and the wider economy	**72.0 – 92.5**
Welfare transfers from airlines to passengers	**-55.2 – -66.9**
Environmental costs	**-0.9 – -3.5**
• Noise impacts	-0.0
• Air quality impacts	-0.0 – -0.4
• GHG emissions	-0.9 – -3.1
Present value of net social benefits	**13.3 – 24.7**

Note: All estimates are in 2010 prices and values. They may not sum due to rounding. Ranges for passenger benefits and welfare transfers represent benefits when 75% and 25% of other costs are included in minimum fares. Ranges in environmental costs represent uncertainty in the monetary costs associated with air quality and GHG emissions. Ranges for the present value of net social benefits reflect the minimum and maximum benefits that the Project may generate: the lower bound includes the lowest benefits and the higher environmental costs, and the upper bound includes the higher benefits and lower environmental costs.

Source: Oxera.

4G Competition impacts

4.143 Increased competition can deliver a range of benefits that are additional to the economic impacts discussed elsewhere in this report.[173] Specifically, increased competition could result in:

- a reduction in fares over and above those anticipated in section 4C;
- increases in service quality as airports and airlines try to make their products more attractive to passengers;
- innovation to discover new cost-effective ways of doing business, and increased efficiency.

4.144 Competition in the aviation sector can occur in a number of ways. In particular:

- competition between airports: airports can compete with one another for airline services, connecting passengers and local passengers;
- competition between airlines for passengers.

4.145 Below, we discuss how the Project would affect competition in the London aviation market.[174]

4G.1 Impact of the Project on competition between airports

4.146 As noted in section 4C, airports in the greater London area have overlapping catchment areas, particularly for passengers departing from or arriving in the London area. As such, Gatwick competes with other airports in this area, particularly Heathrow and Stansted.[175] Airports within this area compete with one another to host airlines and for passengers.

[173] Airports Commission (2014), 'Appraisal Framework', April, p. 31.
[174] As the London airports are competing with each other in the aviation market, we are using the term 'market' instead of the term 'system' used elsewhere in the report to make this relationship explicit while discussing the competition effects. We have not performed a market analysis for this study, and use the term 'market' to refer to the substitutability of airports in the London area for air passengers and airlines.
[175] Civil Aviation Authority (2014), 'Market power determination in relation to Gatwick Airport – statement of reasons', January. The catchment area of an airport is the geographic area from which the airport attracts passengers.

4.147 Capacity constraints are an important factor in determining the level of competition between airports.[176] The additional capacity with the Project would relax the capacity constraints at Gatwick Airport, enabling Gatwick Airport to provide a stronger competitive constraint to other airports in the London market—both for airline location and for passengers.

4.148 It is possible to use the high-level forecasts produced by ICF to inform an assessment of how much traffic might switch between airports as a result of the Project. Switching traffic could be indicative of both competition between airports to host airlines and competition between airports to attract passengers.

4.149 Table 4.24 shows the changes to traffic flows resulting from the Project. The forecasts suggest that the majority of the additional aviation traffic resulting from the Project will be composed of new journeys—i.e. passenger journeys that would not be made without the Project. However, in the first years after the Project's opening, there would be some traffic abstracted from other airports—in particular, Stansted.

Table 4.24 Changes to aviation traffic resulting from the Project (mppa)

	2029	2047
Heathrow	0.0	-0.1
Stansted	-1.3	0.0
Luton	0.0	0.0
City	0.0	0.0
Southend	-0.1	0.0
Gatwick from other airports	**1.3**	**0.1**
Gatwick new traffic	**2.4**	**12.6**

Source: Oxera analysis of ICF traffic forecasts.

4G.2 Impact of the Project on competition between airlines

4.150 By creating additional capacity, the Project will help to facilitate greater competition among airlines. This applies both at Gatwick and across the London aviation market more widely.

4.151 The precise nature of the additional competitive pressure exerted depends on how the additional capacity at Gatwick is employed. The existing forecasts are not sufficiently detailed to allow a detailed assessment. That said, competition could be encouraged both through new airlines operating at Gatwick using the new capacity, and through existing airlines expanding their existing operations by offering a wider range of flights. Alleviating capacity constraints during peak times also enables new slots at times with high passenger demand, allowing airlines operating at Gatwick Airport to offer more services at desirable times and to become more competitive relative to competitors operating at other London airports.

4.152 In its most recent market power assessment for Gatwick, the CAA suggested that there was no clear demarcation between the business models of low-cost carriers (LCCs) and full-service carriers (FSCs), especially in terms of demand for facilities at Gatwick Airport.[177] As such, even if the additional capacity made

[176] Oxera (2017), 'Market power assessments in the European airports sector', November, pp. 23–25.
[177] Civil Aviation Authority (2014), 'Market power determination in relation to Gatwick Airport – statement of reasons', January, para. 2.2.

available by the Project is used by carriers with certain business models (for example, LCCs), the increase in competitive pressure would affect carriers with other business models as well.

4G.3 Conclusion on competition impacts

4.153 Increased activity at Gatwick Airport is likely to attract passengers from the other London airports, especially those who would have preferred to travel using Gatwick Airport in the Baseline scenario but cannot due to capacity constraints. Even though the overall volume of the expected shift is relatively modest in the context of the overall traffic in the London aviation market, this would generate competitive pressure on the other London airports during the initial years of the Project's opening.

4.154 Relieving capacity at Gatwick Airport, especially during peak times, would make new slots available at times with higher demand and would increase competition between airlines.

4.155 Increased competition between airports and airlines could affect prices and quality offered in the London aviation market, resulting in benefits to passengers. To the extent that capacity in the market starts to become fully utilised, over time, it is likely that shadow costs will again start to increase and competition will again take forms other than pure price competition.[178]

4H Resilience impacts

4.156 Resilience of an aviation system refers to the system's ability to continue its daily activities as scheduled despite disruptions. A lack of resilience causes system-wide delays and cancellations through knock-on effects. It increases journey time variability and the number and extent of delays, which decreases the reliability of air travel. We present a discussion of delay times in the London aviation system in Appendix A3.

4.157 Higher resilience would provide benefits to users and providers of the London aviation system. However, the benefits arising from higher resilience would affect users and providers differently from the fare and time effects discussed in the preceding sections. Contrary to these effects, resilience would not have a direct impact on supply and demand in the London aviation market. Instead, higher resilience would mitigate costs associated with disruptions to operation in the aviation market. Thus, its impact would be additional to the impacts captured in section 4C.

4.158 After its construction, the Project could affect resilience at Gatwick Airport and the London aviation system in a number of ways by reducing delays caused by day-to-day unexpected events and major disruptions.[179] In particular:

- additional capacity could increase route frequency. In the event of a problem on a specific route, or with a specific airline, this would reduce delays by allowing passengers to take a replacement flight;
- excess capacity would allow for greater resilience and faster recovery from disruptions to the main runway or the entire airport. It would also enable Gatwick Airport to absorb day-to-day variability in operations with fewer knock-on disruptions;

[178] Competition and Markets Authority (2016), 'BAA airports: Evaluation of the Competition Commission's 2009 market investigation remedies', May.
[179] Resilience during the construction phase of the Project would be lower. This reduction is because the northern runway will not provide any capacity in the event of disruption during construction.

- having additional runway capacity in the London aviation system would contribute to the resilience across the system by enabling it to cope better with major disruptions (particularly disruptions that cause the closure of an airport);
- as the excess capacity at Gatwick Airport falls over time, the resilience provided with the Project would also fall over time.

4.159 The increased number of passengers with the Project means that a given disruption would affect more passengers. However, the increased flexibility and faster recovery from disruptions that the extra capacity provides would reduce the cost of disruption per passenger. Even when the extra capacity is used in the very long term, and if the speed of recovery from disruptions slows down over time, flexibility in designing system-wide disruption recovery strategies provided by an additional runway would remain.

4.160 Below, we discuss how excess capacity would help to increase resilience in the London aviation system during day-to-day and major disruptions.

4H.1 Day-to-day disruptions

4.161 Our appraisal of the user and provider benefits of the Project in section 4C quantifies the benefits arising from expected changes in travel times that are attributable to better daily operations. In order to avoid double-counting these benefits, in this section we focus instead on how the Project would be helpful in addressing unexpected day-to-day disruptions and increasing the speed of recovery from these disruptions.

4.162 Various events may cause temporary fluctuations in the operational capacity of an airport, such as unexpected short-term closures of a runway or bad weather. The closure of a runway could mean that flights have to depart, or land, later than their scheduled times. If an airport is operating close to full capacity, finding an available time slot to recover from these delays may be difficult.[180]

4.163 In principle, the expected impact of disruptions will depend on their frequencies and durations. Severe but rare types of disruption, such as that caused by volcanic ash that disrupted European aviation in 2010, or the disruption at Gatwick in December 2018 due to drone activity, may incur high costs to passengers, airlines and airports; however, frequent but less severe disruptions may be more costly in the long run. Thus, the benefits of additional capacity at Gatwick Airport to deal with day-to-day disruptions would be an important additional benefit arising from the Project.

4.164 Additional capacity with the Project would help Gatwick Airport to deal with short-term disruptions more efficiently by providing opportunities to be flexible about allocating departing flights to separate runways in case of unexpected delays. As a result, recovery from a day-to-day disruption would be faster, and there would be fewer knock-on delays. This would decrease the delays for passengers and reduce operational costs that might otherwise be incurred by airlines.

4.165 Box 4.5 illustrates how this mechanism would work in a stylised scenario.

[180] Gatwick Airport operates at full capacity during peak times of the day.

Box 4.5 Recovery from a runway closure

In this stylised scenario, we quantify the benefits of the additional capacity that the Project is expected to provide in the event of a one-hour closure of the main runway at Gatwick Airport. Such an event may occur for various reasons, such as a physical problem with the runway.

To model this event, Gatwick Airport provided us with estimated hourly capacity and demand with and without the Project for an average day in 2040. We have extrapolated hourly demand proportionately using traffic forecasts in order to obtain estimated hourly demand at Gatwick Airport with and without the Project for an average day in each year of our appraisal period.

We make the following assumptions to characterise the event:

- on average, the event occurs two to three times a year;
- each day in our appraisal period has the same likelihood of the event occurring;
- the event can occur at any time of the day from 05.00 to 22.00 with the same probability;
- when the event occurs, the runway is unavailable for one hour;
- no additional night flights can be scheduled to make up for lost time during the day.

This calculation is intended to provide a rough illustration rather than a precise estimate of the magnitude of this effect.

We use demand and capacity assumptions on an average day to estimate the number of affected flights in the Baseline and Project scenarios. When there is no excess capacity to accommodate these delayed flights after the disruption is over, there will be knock-on delays until full recovery is achieved. This procedure is illustrated with a worked example in Table 4.25.

Table 4.25 Worked example of recovery from a runway closure

Time of day	Number of flights	Excess capacity	Delayed flights
10.00 (disruption)	20	6	14
11.00	20	6	8
12.00	20	6	2
13.00	20	6	0

Note: This worked example assumes a disruption at 10.00, 20 scheduled flights each hour, and an excess capacity of six. From 10.00 to 11.00 the runway is closed, and 20 flights are delayed. From 11.00 to 12.00 there are 20 separate scheduled flights; however, the airport has capacity to operate six more flights, as indicated by its excess capacity. This excess capacity is used to recover six of the 20 delayed flights. The remaining 14 flights cause knock-on delays. This procedure continues until enough excess capacity is used to recover fully from the disruption between 13.00 and 14.00.

Source: Oxera.

In this way, excess capacity allows the airport to recover from the event faster. We value the time savings to passengers using values of time for different passenger types sourced from the DfT's TAG Data Book,[181] split by journey purpose following the traffic forecasts.

In order to reflect the randomness of the event's occurrence, we repeat this example many times, and calculate the expected benefits from increased resilience with the Project as the average of the estimated benefits from repeated trials.

Source: Oxera.

4.166 Our analysis in this stylised scenario indicates that the present value of time benefits to passengers from faster recovery are £30.1m. Our stylised scenario captures around 1,400 aircraft hours of annual delay, which corresponds to only 1.7% of the delays experienced at Gatwick Airport in 2019.[182] Even though only a part of the remaining delay times would be related to capacity

[181] Department for Transport (2020), 'TAG Data Book', Forecast values of time per person, July.
[182] Civil Aviation Authority (2019), 'Punctuality Statistics: Full and Summary Analysis'.

constraints, this small percentage implies that there could be larger gains from increased resilience. Further data would be required to evaluate the impact of other relevant types of day-to-day disruptions and benefits from faster recovery. It is intended to provide further information on this aspect in the final Economic Impact Report submitted in support of the Environmental Statement. Moreover, our stylised framework does not quantify the benefits from reduced reactionary delays at other airports and reduced operational expenditure of airlines, and therefore the estimate of this effect is likely to be an underestimate.[183]

4.167 It is important to note that, in the event of a disruption that lasts a long time and would enable the standby runway in the Baseline scenario, resilience at Gatwick Airport would be lower with the Project because some of the capacity that the standby runway can provide will already be in use.

4H.2 Major disruptions

4.168 Major disruptions such as prolonged severe weather conditions may halt operations at an airport for some time. Airports and airlines can help passengers in these situations by:

- re-routing flights to other airports;
- re-booking disrupted passengers onto later flights;
- providing assistance to stranded passengers.[184]

4.169 In the event of a major disruption at a London airport other than Gatwick Airport, the Project would enable Gatwick Airport to accept more re-routed flights from the disrupted airport. Although inconvenient for passengers, re-routings could reduce the negative impacts of major disruptions by enabling more passengers to reach their destinations (or a close alternative) with less delay.

4.170 Quantifying the benefits from such events is inherently difficult, as they occur very rarely and involve high costs. In general, the cost of such an event depends on the expected severity of the event and the outside options of different stakeholders. In particular, the following factors are important in understanding the costs associated with a major disruption:

- frequency and duration of the disruption;
- options available to passengers, airlines and airports to manage the disruption;
- the costs and benefits associated with these options.

4.171 In the event of a major disruption elsewhere in the London aviation system, the Project would help to alleviate the cost of the disruption by allowing more flights to be re-routed to Gatwick Airport. As a result, there would be fewer delays and more passengers would be able to complete their journey. Even though re-routing may not be an ideal solution for passengers, for some passengers it would be preferable to cancellations.

[183] A reactionary delay is a type of delay caused by late arrival of an incoming aircraft from previous journeys. A faster recovery at Gatwick Airport would reduce delay times of departures and, as a result, reactionary delays at other airports connected to Gatwick Airport. Therefore, there would be a system-level positive spillover effect from increased resilience at Gatwick Airport.
[184] Civil Aviation Authority (2010), 'Aviation's response to major disruption', Final Report.

4.172 The Project would have a different impact on the resilience of the London aviation system if a major disruption occurred at Gatwick Airport. With the Project, increased capacity would allow the airport to serve more passengers. This implies that, in the event of a major disruption at Gatwick Airport, more passengers would be subject to the costs of the disruption—for example, more passengers would have to be re-routed.

4.173 Finally, because the benefits of the Project to the resilience of the London aviation system depend on the excess capacity provided with the Project, the positive impact of the Project on resilience would decrease over time as the additional capacity provided is used and excess capacity declines. Still, compared with the Baseline, the additional capacity with the Project would provide an alternative to recover from major disruptions that otherwise would not exist.

4H.3 Conclusion on resilience

4.174 We appraised the benefits of reduced travel times as a part of our assessment of user and provider benefits of the Project under normal operational conditions. Increased resilience in the aviation system allows airlines and airports to respond faster and with more options to unexpected events that may cause delays in the aviation system. This would result in quicker recovery, reducing the discomfort and welfare loss to passengers and providers from disruption. Benefits from increased resilience are therefore additive to the benefits quantified elsewhere in this appraisal.

4.175 By providing an additional operational runway, the Project would result in quicker recovery from minor disruptions at Gatwick Airport and more flexibility in addressing major disruptions at other London airports that may require re-routing of flights. Even if the resilience benefits would decline as the additional capacity provided by the second runway is used over time, there would still be an alternative to recover from disruptions that would not exist absent the Project.

4I Freight impacts

4.176 In 2019, Gatwick Airport handled 150,000 tonnes of freight.[185] The Project will help to facilitate an increase in air freight at Gatwick Airport by increasing the number of ATMs and thereby increasing both the frequency and range of destinations served.

4.177 Freight traffic at Gatwick Airport is generally provided by bellyhold rather than by dedicated freighter aircraft[186] and, as a result, an increase in the number and range of passenger aircraft movements will have a direct bearing on opportunities for freight traffic. According to forecasts provided by ICF, air freight traffic will increase by 20% in the long run when compared with the Baseline. We present the cargo forecasts with and without the Project in Table 4.26 below.

[185] Gatwick Airport Limited data (2020).
[186] Airports Commission (2014), 'Gatwick Airport Second Runway: Business Case and Sustainability Assessment', para. 1.41.

Table 4.26 Gatwick Airport cargo forecasts (thousand tonnes)

	2018/19	2029/30	2038/39	2044/45	2047/48
Baseline	157	228	254	278	290
Project	157	251	323	340	348
Difference (percentage of base case)	–	**10%**	**27%**	**22%**	**20%**

Source: ICF.

4I.1 Economic value of air freight

4.178 Air freight creates economic value to users by creating new opportunities for trade. For example, the speed of air freight makes it indispensable to highly time-sensitive supply chains. Where especially precise timing is required, freight services can be sold on the premise of a guaranteed delivery slot. Such services also often provide up-to-date information on geographical position, estimated time of delivery, details of delays, and revised delivery times.[187] More specialised air freight services can combine the mode's delivery speed with storage that meets niche requirements, for example relating to temperature, security or industry-specific regulations. Businesses that benefit from these kinds of services include providers of perishable foodstuffs and pharmaceuticals.[188]

4I.2 Economic appraisal

4.179 The DfT's TAG recommends that 'where possible, the impact of aviation policies on air freight should be appraised'.[189] In its guidance, the DfT demonstrates that an expansion at a capacity-constrained airport should lead to an increase in surplus for air freight customers. Specifically, by relaxing the constraint, the quantity supplied should rise and the unit price should fall.[190] The DfT forecasts that London's main airports, including Gatwick Airport, will become capacity-constrained by 2025.[191] However, the DfT's TAG does not provide detailed guidance on how such an appraisal should be conducted. As such, we have not sought to produce a quantified assessment as part of this study.

4J Conclusion

4.180 We have quantified the impact of the Project on participants of the aviation market (passengers and providers), the wider economy, and government revenues. Combined with the environmental costs of the Project, we have calculated the societal impacts of the expansion, and present the Project's net social benefit in Table 4.27.

4.181 GAL proposes to privately fund the construction and operational costs arising from the Project to enable the societal benefits valued at £13.3bn to £24.7bn depending on forecast costs of the environmental impacts of the Project. We have valued these costs at £2.7bn in section 4B. Considering these additional costs, we estimate the NPV of the Project to be £10.5bn to £22.0bn by subtracting the quantified costs from the quantified benefits.[192] Table 4.27

[187] Steer (2018), 'Assessment of the value of air freight services to the UK economy', October, p. 4.
[188] Steer (2018), 'Assessment of the value of air freight services to the UK economy', October, p. 4.
[189] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May, p. 5.
[190] Department for Transport (2018), 'TAG Unit A5.2 Aviation Appraisal', May, p. 13.
[191] Gatwick Airport (2018), 'Draft Master Plan 2018', https://www.gatwickairport.com/globalassets/business--community/growing-gatwick/gatwick-draft-master-plan-final.pdf, p. 11, accessed 5 May 2021.
[192] These estimates are, on average, comparable to the NPV of Crossrail at £12.3bn in 2010 prices and values. Oxera (2017), 'Investment in rail: the economic benefits', October.

presents the quantitative estimates of the costs and benefits of the Project in 2010 prices and values.

Table 4.27 Summary of benefits/costs and the net present value of the Project (£bn)

Passenger benefits	60.1 – 78.8
Provider benefits	-52.8 – -64.5
Government revenues	4.7
Wider economic impacts	4.7 – 6.6
Environmental costs	-0.9 – -3.5
Scheme costs	-2.7
NPV of the Project	**10.5 – 22.0**

Note: All estimates are in 2010 prices and values. They may not sum due to rounding. Negative provider benefits represent welfare transfers from airlines to existing air passengers. Ranges for passenger benefits and welfare transfers represent benefits when 75% and 25% of other costs are included in minimum fares. Ranges in environmental costs represent uncertainty in the monetary costs associated with air quality and GHG emissions. Ranges for the present value of the Project reflect the minimum and maximum benefits that the project may generate: the lower bound includes the lowest benefits and the higher environmental costs, and the upper bound includes the higher benefits and lower environmental costs.

Source: Oxera.

4.182 There would be other benefits and costs arising from the Project that the NPV metric does not capture. In particular, we have discussed the Project's potential impacts on tourism, FDI and trade, competition, resilience, and freight, and discussed the overall benefits of these impacts in the relevant sections. We have also discussed additional costs that may arise from the Project in these sections. Even in the presence of these unquantified benefits and losses, our analysis suggests a substantial positive net social value, and NPV, accruing to UK society from the Project.

5 Local economic impact of the Project

This section provides an assessment of the economic impact of the Project in the three study areas in terms of employment and value added. We report our estimates in 2021 prices. Employment figures are expressed in terms of headcount rather than FTE.

In this analysis, we focus on three overlapping local areas: the Gatwick Diamond, the Coast to Capital LEP, and the Five Authorities area, as described in section 3E above.

By increasing capacity at Gatwick Airport and the economic activity associated with that, the Project is expected to increase employment and generate additional value related to the airport's activities. In section 5C we evaluate the scale of activities at the airport with and without the Project.

Overall, the Project would represent an economic footprint of £1.6bn in GVA and 20,300 additional jobs in 2038, including:

- economic activity on site at the airport (direct footprint of £284m GVA and 3,200 jobs);
- economic activity of the supply chain of firms on site (indirect footprint of £492m GVA and 6,300 jobs);
- economic activity of firms choosing to be located near the airport for its connectivity (catalytic footprint of £848m GVA and 10,800 jobs).

Some of the additional value and employment generated by the Project could have been utilised elsewhere absent the Project. We estimate the net impacts of the Project in section 5D to reflect the benefits generated above and beyond those that would have arisen anyway. The Project would generate net impacts locally of £1.1bn in GVA and 13,800 additional jobs in 2038.

Source: Oxera.

5.1 We consider the local impact of the Project from three of the perspectives introduced in section 3A.

- The **economic footprint** measures the total resources, whether on or off site, used in delivering the economic activity at Gatwick, by GVA or employment numbers.[193] It is useful to measure Gatwick's footprint to identify the scale of the airport and the additional output that would be generated by the Project.
- **Net economic impacts** reflect the benefits generated above and beyond those that would have arisen anyway had people employed at Gatwick been doing something else. In practice, net impacts assess the incremental effect of the Project by taking into account how resources would be used in its absence.
- **Welfare impacts** measure the benefits that accrue to passengers travelling through Gatwick or employees working on site (GAL and non-GAL) at Gatwick Airport in terms of the time and cost of accessing air travel and the airport. It is intended that further information on this aspect will be provided in the final Economic Impact Report submitted in support of the DCO application.

5.2 Table 5.1 provides a summary of the different components of this analysis.

[193] GVA is a standard measure of economic activity that statistical agencies (such as the Office for National Statistics—ONS, and Eurostat) routinely use to ascertain an industry's contribution to an economy's total output. It is defined as the total value of output from a service excluding the value of any intermediate inputs (i.e. outputs of other sectors used as inputs to the supply chain).

Table 5.1 Local impacts overview

	Type of impact	Analysis
Economic footprint	Direct footprint	Economic activity of firms on site at the airport. Examples include air crews or airport management staff
	Indirect footprint	Economic activity of the supply chain of firms at the airport, such as aircraft parts manufacturers or maintenance (that are not based on the airport campus)
	Catalytic footprint	Economic activity of firms—that are not in the indirect footprint of the airport—choosing to be located near the airport because of the connectivity that it offers; an example might be a professional services firm opening a new office near Gatwick Airport or a hotel expanding in the area as a result of the proximity and connectivity that the airport offers
Net economic impacts	Labour supply	Net economic impacts on jobs in the study areas
	Job productivity	Additional productivity generated by jobs related to airport activities
	Catalytic net impacts	Net catalytic impact of the airport considering that firms could locate or expand in another location without the connectivity offered by Gatwick
Welfare impacts	Business passengers	Benefits accruing to users and employees of Gatwick as a result of the ease of access to air travel provided by the airport in terms of travel time and cost
	Leisure passengers	
	Gatwick employees	
	Imperfectly competitive markets	Reflecting the fact that some producers in the economy charge prices above the cost of production. If the cost of production falls because of a transport efficiency improvement, business user benefits do not capture the full benefit

Note: Each impact is discussed in more detail, including its respective geographic footprint and the type of employment associated, in the following sections.

Source: Oxera.

5.3 Before discussing the local impacts of the Project from these three perspectives, we provide an overview of the local economic context within our Five Authorities study area. This economic context represents the socioeconomic background against which the Project development will take place and therefore informs the scope for local employment and the economic impacts of the Project.

5A Local economic baseline

5.4 In this section, we present economic and demographic data for the three study areas—the Gatwick Diamond, the Coast to Capital LEP, and the Five Authorities area—that will put the local and regional economic impacts of the Project impacts that we estimate in section 6 into context.

5.5 We looked at data on population, education, the labour market, enterprises, and deprivation. We present here the summary conclusions from this review, while a more detailed assessment of each category of statistics and study area can be found in Appendix A4.

5.6 As the significant impact of the COVID-19 pandemic on employment and economic activity in 2020 would make this year an unreliable benchmark for the state of the economy for the time horizons of the Project, our analysis principally uses 2019 data, as this is the latest available year that can be considered as a relevant benchmark for the long-term socioeconomic conditions in the UK and these local study areas.

5.7 In the boxes below, we summarise some of the key economic characteristics of the three study areas based on the data discussed above. The impact of the UK's departure from the EU and the COVID-19 pandemic are still unclear, but may result in lower levels of international migration (which has been a key factor driving population growth) and greater levels of mobility in particular types of employment, which may support the economy and population of these study areas.

Box 5.1 Key characteristics of the Gatwick Diamond

- **Population growth**: the Gatwick Diamond showed relatively high rates of population growth between 2004 and 2009, driven by internal migration (from the rest of the UK) and international migration (from the rest of the world).
- **Employment**: the data shows that the Gatwick Diamond is characterised by high rates of employment and economic activity.
- **Educational attainment**: residents tend to have higher qualification levels than in the rest of England.
- **Earnings**: residents tend to earn more than residents in other areas of England.
- **Deprivation**: the area is generally not deprived compared with the rest of England. However, access to housing appears to be a relative weakness in the area and especially in Crawley.
- **Impact of the COVID-19 pandemic**: the local economic activity was negatively affected although the implementation of furlough limited the impact. Looking forward, increased mobility due to sustained working from home practices could motivate structural changes to the relationship between economic activity and employment within this area.

Source: Oxera.

Box 5.2 Key characteristics of the Coast to Capital LEP

- **Population growth**: the Coast to Capital LEP showed relatively high rates of population growth between 2007 and 2014, driven by international migration (from the rest of the world) and, to a lesser extent, internal migration (from the rest of the UK).
- **Employment**: the data shows that the Coast to Capital LEP is characterised by relatively high rates of employment and economic activity.
- **Educational attainment**: residents tend to have higher qualification levels than in the rest of England.
- **Earnings**: residents tend to earn more than residents in other areas of England.
- **Deprivation**: the area is generally not deprived compared with the rest of England, with Brighton and Hove and Croydon being notable exceptions (due to multiple factors including relatively high levels of crime and income deprivation). However, access to housing appears to be a relative weakness across the area.
- **Impact of the COVID-19 pandemic**: the local economic activity was negatively affected, although the implementation of furlough limited the impact. Looking forward, increased mobility due to sustained working from home practices could motivate structural changes to the relationship between economic activity and employment within this area.

Source: Oxera.

Box 5.3 Key characteristics of the Five Authorities area

- **Population growth**: the Five Authorities area showed relatively high growth between 2006 and 2009, driven primarily by internal migration (from the rest of the UK).
- **Employment**: the data shows that the Five Authorities area is characterised by relatively high rates of employment and economic activity.

- **Educational attainment**: residents tend to have higher qualification levels than in the rest of England.
- **Earnings**: residents tend to earn more than residents in other areas of England.
- **Deprivation**: the area is generally not deprived compared with the rest of England, but substantial variation exists within the area.
- **Impact of the COVID-19 pandemic**: the local economic activity was negatively affected, although the implementation of furlough limited the impact. Looking forward, increased mobility due to sustained working from home practices could motivate structural changes to the relationship between economic activity and employment within this area.

Source: Oxera.

5.8 In the following section, we discuss the COVID-19 pandemic and its impact on our assessment of local impacts. We then discuss our economic footprint estimates in section 5C and our net economic impact estimates in section 5D. Finally, we finally give a summary of our local economic impact assessment in section 5E.

5B The COVID-19 pandemic and its impact on our assessment

5.9 As discussed in section 3D, our analysis is based on the assumption, made by GAL, that the COVID-19 pandemic will have a limited influence on the passenger volumes using the Project in the long run. As a result, we use 2019 as the reference base year (as this is the most recent year for which data is available that is not affected by the COVID-19 pandemic), and therefore our data inputs correspond to 2019 data although we report GVA in 2021 prices.

5.10 In this section, we show the results of our analysis on the basis of ICF's traffic forecasts as shown in Figure 3.4. We also provide impact estimates for a sensitivity around these forecasts in Appendix A7, which assumes slower growth of traffic in the overall London system and at Gatwick. As discussed in section 3C, the objective of this sensitivity is to show the effect on the assessed economic impacts of lower traffic demand looking forward.

5.11 However, some of our inputs have been adjusted to reflect the long-run impact of the COVID-19 pandemic where relevant and where up-to-date data was available to do so. Most notably, we use updated estimates for total local employment within the study area from Cambridge Econometrics,[194] which reflect the long-term effect of the pandemic on employment. Where it is not stated otherwise, it is assumed that macroeconomic relationships that held in 2019 will remain constant in the long run.

5C Economic footprint

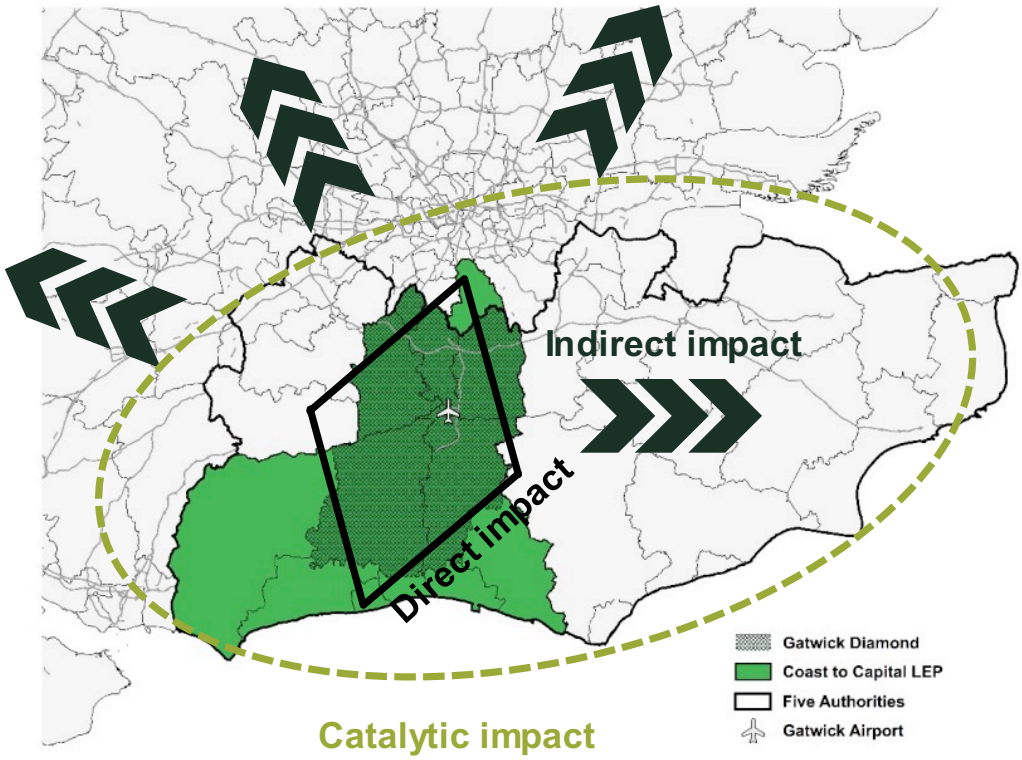
5.12 In this section, we focus on the economic footprint of Gatwick Airport as a whole and the GVA of the Project, which provides a measurement of the scale of economic activity supported by the airport. This activity is typically measured by considering employment or GVA.

5.13 Gatwick's economic footprint consists of three main components: a direct footprint, an indirect footprint, and a catalytic footprint. Figure 5.1 illustrates the geographic reach of each impact: direct impacts are restricted to the Gatwick Diamond; indirect impacts cover the whole of the UK, since Gatwick suppliers can be located anywhere in the country and abroad; and catalytic impacts are

[194] Cambridge Econometrics (2021), 'Local employment by industry', March.

located in the wider study area, since they are related to the connectivity that the airport provides in the local area.

Figure 5.1 Geography of footprint impacts

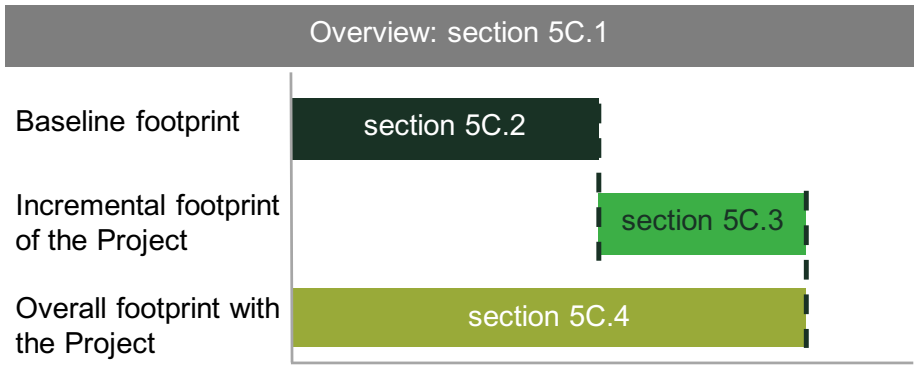


Source: Oxera.

5.14 The following subsections discuss the local footprint analysis in more detail. First, we provide an overview of the results of the footprint analysis in subsection 5C.1. We then describe the analysis of the Baseline scenario (i.e. without the Project)[195] and the footprint methodology in general in subsection 5C.2. We then estimate the additional value associated with the Project in subsection 5C.3 and, finally, we estimate the overall footprint of Gatwick Airport with the Project in subsection 5C.4.

5.15 Figure 5.2 below provides an overview of the structure of the footprint section.

Figure 5.2 Economic footprint overview



[195] In this section of the report, the 'do minimum' scenario is referred to as the 'Baseline' scenario. The Baseline scenario will constitute the counterfactual to the expansion that we will use as a benchmark to assess the additional value of the Project relative to the baseline.

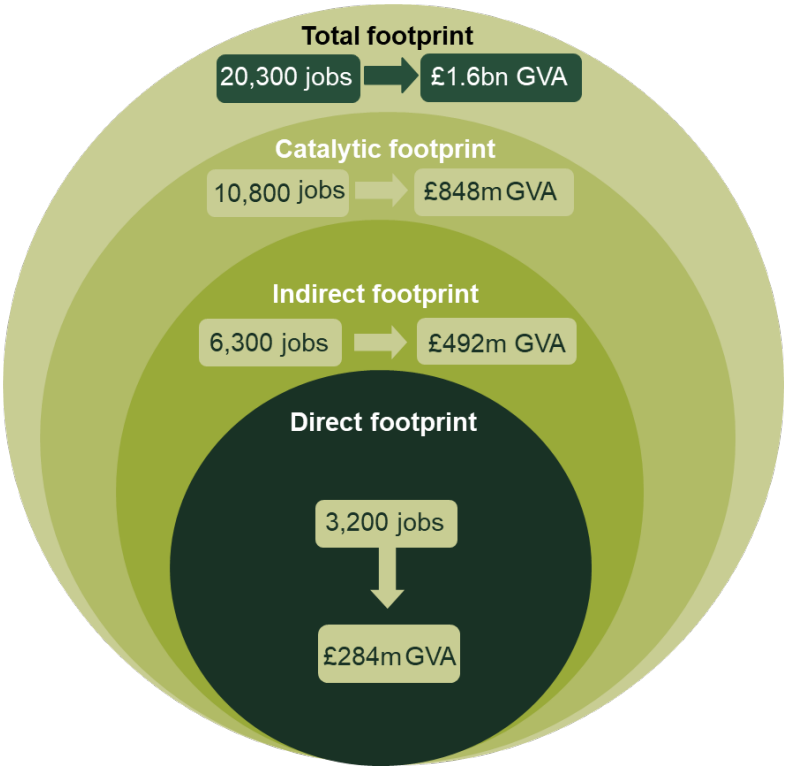
Source: Oxera.

5C.1 Overview of the economic footprint

5.16 Our footprint analysis shows that the Project will measurably increase the scale of the airport's activities in the three study areas around the site and the UK as a whole, in terms of both employment and value added.

5.17 Figure 5.3 below presents the results of the footprint analysis of the Project (i.e. the additional value of the Gatwick expansion over the Baseline scenario) in the year 2038. It shows that, in 2038, the direct impact of the Project will be sizable (3,200 jobs for £284m GVA), and that there would be substantial economic impacts in the supply chain (6,300 jobs for £492m GVA). These figures also detail the connectivity that the expansion will provide (10,800 jobs for £848m GVA in 2038), which suggests that the Project will generate significant local economic impacts. Our estimates suggest that the total economic footprint of the project in 2038 will be £1.6bn of GVA and 20,300 jobs, which will increase to £1.8bn of GVA and 19,000 jobs in 2047.[196]

Figure 5.3 The Project footprint overview in 2038



Note: These values correspond to 2038 estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. Direct footprint impacts occur on site at Gatwick Airport (i.e. within the Gatwick Diamond). The indirect footprint corresponds to the supply-chain footprint of the Project in the UK as a whole. The catalytic footprint occurs in the vicinity of the airport (i.e. the Five Authorities area).

Source: Oxera analysis.

5.18 We now describe the data and methodology for estimating the economic footprint.

[196] The GVA impact increases between 2038 and 2047, while the job footprint decreases due to increasing productivity per worker between the two assessment years, particularly among those in the supply chain of the airport. Employment figures are expressed as headcounts.

5C.2 Baseline economic footprint

5.19 In this subsection, we discuss the methodological framework to calculate the economic footprint, and explain the Baseline (i.e. the situation without the Project) footprint estimates.

Direct footprint

5.20 The **direct footprint** is the employment and GVA that is directly associated with the firm, site, sector or economy concerned. In the case of Gatwick Airport, we include both GAL and other firms that operate on the Gatwick Airport site.

5.21 The direct GVA is equal to the sum of profits and worker compensation for activities located on the site of Gatwick Airport.[197] For GAL itself, this information has been obtained from GAL's annual report. Employment numbers are also obtained directly from GAL's 2019 annual report. This is used as a base year.

5.22 For other firms on site, ICF has provided information on the breakdown of employees on site by sector based on GAL's 2015/16 Travel to Work survey data.[198] This was combined with information on average wages for staff on site at Gatwick Airport from the Travel to Work survey and data from the Office for National Statistics (ONS) on the ratio of labour costs to GVA[199] in these sectors to estimate the GVA that these jobs would be expected to generate.

5.23 As discussed in section 5A above, our analysis is based on the assumption, made by GAL, that the COVID-19 pandemic will have a limited influence on the passenger volumes using the Project in the long run. By extension, we assume that any furlough scheme that was used in 2020 by either GAL or other companies on site would have ended by the time the expansion is intended to take place. As traffic is forecast by ICF to recover to 2019 levels by 2024/25, so would employment requirements on site. While some structural shifts in working policies such as increased working from home practices may take place as a result of the pandemic, the overall impact on the location of staff is likely to be limited given the largely 'hands-on' nature of the roles on site at the airport. Absent any relevant information on the likelihood of these long-term changes in practices, we have conservatively assumed that these policies would have a limited impact on employment and productivity.

5.24 We assume that direct GVA and employment grow in line with ICF's forecasts of total direct on-site employment by occupation. ICF's assumptions on productivity are discussed in more detail in Box 5.4 below. The average wage for employees at GAL is uplifted to future years using the forecast growth in real GDP per household.[200] Future profitability for GAL was estimated using calculated future staff costs multiplied by the ratio of GAL profits[201] to staff costs in 2019, which is assumed to remain constant.[202] For non-GAL direct GVA, we assume that the ratio of labour costs to GVA from ONS data remains

[197] Office for National Statistics (2019), 'Regional accounts methodology guide: June 2019', section 3.
[198] Gatwick Airport Limited (2016), 'Gatwick Employer and Travel to Work Survey 2016', Table 7.
[199] Office for National Statistics (2020), UK Input-Output Analytical Tables (2016 data).
[200] Department for Transport (2020), 'WebTAG databook', July.
[201] Measured by EBITDA (earnings before taxes, interests, depreciations, and amortisation).
[202] For the purposes of our analysis, we have assumed that the COVID-19 pandemic would not have a long-term impact on GAL's profitability, and have therefore used 2019 as a baseline for the relationship between profitability and staff costs. We have also assumed, absent any relevant information suggesting otherwise, that profitability from the Project would not be structurally different from that of the rest of the airport.

constant, which we combine with the uprated average wage and employment numbers as discussed above to estimate future GVA.

Box 5.4 Productivity gains in direct employment forecasts

ICF has produced forecasts for on-site employment with and without the Project. The forecasting approach was to split the direct on-airport employment data into various job function groups (such as Air Cabin Crew and Airport/Airline Management) to provide a baseline on which to forecast the growth across the airport. Future employment was forecast by correlating each grouping to an appropriate traffic metric (such as ATMs). The elasticity to the traffic metric was determined based on historical patterns, experience at other airports, and a reasonable degree of productivity improvement depending on the nature of the job and advances in technologies. A range of factors are assumed to drive the ongoing efficiency improvements.

- Ground-handling technologies such as autonomous vehicles and terminal robots will drive operational efficiencies on the ground. Further efficiencies will be driven by ongoing increases in average aircraft size.
- Passenger & baggage processing technologies will continue to make the security and customs/immigration processes for passengers and luggage screening more efficient. Significant developments have been introduced that focus on check-in, with recent gains focusing on the security procedures. In the long term, there will be opportunities to use remote technologies to support processes such as security to drive efficiency further.
- Some job categories do not require increases in labour in proportion to passenger growth. For example, Airline/Airport management and IT functions are expected to scale at a fraction of passenger growth.
- Future traffic growth assumptions include significant growth of away-based carriers, which typically rely on non-UK-based staff for much of their operation (such as Pilots and Cabin Crew).

Source: ICF.

5.25 We have been provided with two scenarios for direct employment at the Gatwick site: a Baseline scenario for Gatwick Airport without the Project, and a Project scenario with the Project. Within these two scenarios, local economic impacts are estimated for 2019 and four future scheme years: 2029, 2032, 2038 and 2047.

5.26 Table 5.2 below shows the direct footprint estimates for the baseline cases in 2029, 2032, 2038 and 2047. It forms the baseline against which we compare the Project estimates. Baseline footprint estimates suggest that, in 2019, close to 24,100 people were employed at Gatwick, generating £1.4bn in value added. In the absence of the Project, employment at Gatwick is projected to increase to 28,800 jobs and £2.5bn GVA (in 2021 prices) by 2038. These values also reflect GAL's high productivity pre-pandemic, part of which could be attributed to the capital-intensive nature of activity at an airport.[203]

Table 5.2 Baseline direct footprint

	2019	2029	2032	2038	2047
GVA footprint (£m)	1,656	2,094	2,237	2,537	3,107
Employment footprint	24,100	27,600	28,100	28,800	29,700

Note: Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: GAL, ICF; Oxera analysis.

[203] Capital intensity is estimated by the ONS using the ratio of capital stocks estimates to GVA. The 'transport and storage' sector in general is among the most capital-intensive in the UK. Office for National Statistics (2019), 'Capital stocks and fixed capital consumption, UK: 2019', November.

5.27 As discussed in section 5A, employment rates in the Five Authorities area are generally high. The presence of Gatwick Airport contributes to employment both through activity on site at the airport and through its supply chain.

Indirect footprint

5.28 The **indirect footprint** refers to the employment and GVA supported throughout the UK via the supply chains of the firms located at Gatwick Airport.

5.29 We estimate indirect GVA based on the sum of profits and employee compensation generated throughout the UK from the supply-chain spending of firms on site at Gatwick Airport, using the steps described in Table 5.3 below.

Table 5.3 Indirect footprint calculations

Main outputs	Relevant metrics	Description
Direct output by sector on site (D = A x B x C)	Direct GVA footprint (A)	From the direct footprint analysis. See Table 5.2 above
	Staff share by sector on site (B)	Data from GAL 2015/16 Employer and Travel to Work Survey. Numbers of employees by occupation were matched to ONS sectors
	Output/GVA ratio by sector on site (C)	We use ONS data on UK Input-Output Tables[1] to calculate the ratio of GVA per final unit of output
Supply-chain (indirect) output by product (G = D x E x F)	Direct Output by sector on site (D)	As calculated above
	Share of product output by sector (E)	We use ONS data on UK Input-Output Tables[1] to calculate the sum of output for each product within a given sector, and divide it by the sum of output for the sector to obtain the share
	Supply-chain spending multiplier by unit of final output (F)	We use ONS data on UK Input-Output Tables (Leontief)[1] to obtain the output multiplier for supply-chain spending given a unit of final output in a product
Supply-chain (indirect) GVA (I = G / H summed across products)	Supply-chain (indirect) output by product (G)	As calculated above
	Output/GVA ratio by product (H)	We use ONS data on UK Input-Output Tables[1] to calculate the ratio of GVA per final unit of output

Note: [1] Office for National Statistics (2020), UK Input-Output Analytical Tables (2016 data).

Source: Oxera analysis.

5.30 Unlike the direct economic footprint (which, by definition, is all contained on site at Gatwick Airport), the indirect footprint will be spread across a wide geographic area. In order to estimate the local economic footprint for each of our three study areas, it is necessary to form a view of how much indirect activity would be retained locally and how much would 'leak' out into the rest of the UK. To do this, we use two pieces of evidence:

- an Oxford Economics report entitled 'The Economic impact of Gatwick Airport', which presents a disaggregation of Gatwick Airport's indirect GVA[204] into a share corresponding to the Gatwick Diamond (24%), a share

[204] Oxford Economics (2017), 'The Economic impact of Gatwick Airport', p. 13.

for the Coast to Capital LEP (14%), and a share for the rest of the UK. We use this evidence from 2016 to benchmark our indirect GVA disaggregation;

- ONS data on GVA for each LAD in the UK.[205] This data allows us to calculate the distribution of GVA across LADs in each study area to distribute the total indirect footprint.

5.31 For the purposes of our analysis, we assume that this geographic distribution of indirect activity remains constant over time and would not significantly change looking forward as a result of the COVID-19 pandemic.

5.32 Table 5.4 shows the estimated indirect footprint for the baseline as well as estimates of the indirect footprint for each of our three study areas. Estimates for each study area in the table include the significant overlaps between regions—i.e. the Coast to Capital estimate includes the indirect footprint in the Gatwick Diamond—in order to show the relative magnitude of each area.

Table 5.4 Baseline indirect footprint

	2019	2029	2032	2038	2047
Indirect GVA (£m)	**2,874**	**3,633**	**3,881**	**4,402**	**5,391**
of which Gatwick Diamond	689	870	930	1,055	1,292
of which Coast to Capital LEP	1,082	1,368	1,462	1,658	2,030
of which Five Authorities	2,003	2,532	2,705	3,069	3,758
of which the rest of the UK	754	953	1,018	1,154	1,414
Indirect employment	**47,800**	**53,800**	**54,700**	**56,100**	**57,900**
of which Gatwick Diamond	11,500	12,900	13,100	13,400	13,900
of which Coast to Capital LEP	18,000	20,300	20,600	21,100	21,800
of which Five Authorities	33,300	37,500	38,100	39,100	40,400
of which the rest of the UK	12,500	14,100	14,300	14,700	15,200

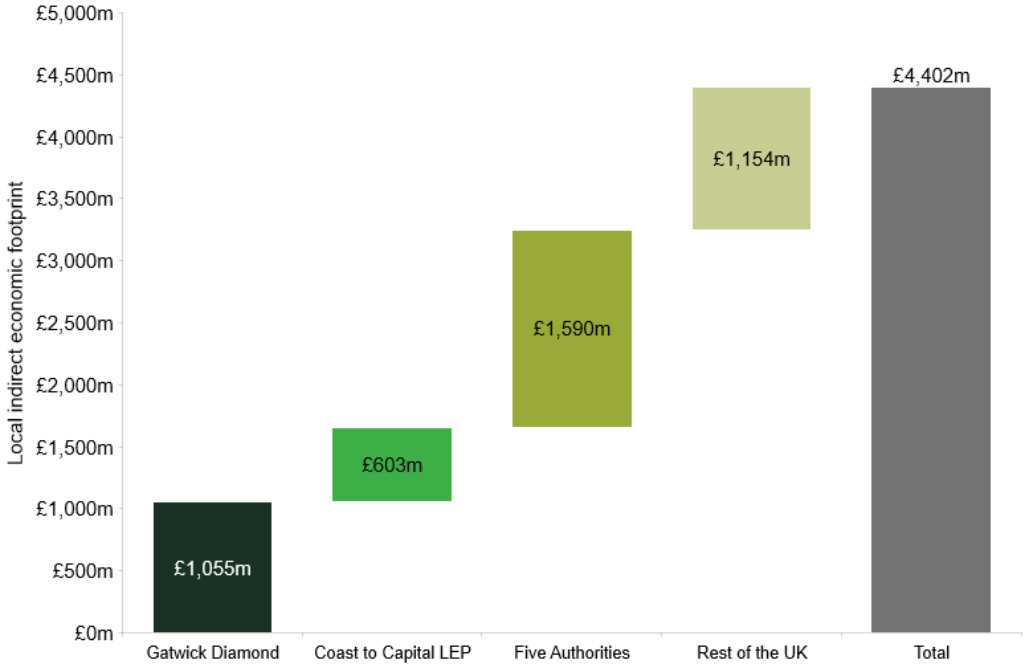
Note: Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. Figures for each study area include potential overlaps—i.e. the Coast to Capital estimate includes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not, such that the total indirect impact corresponds to the sum of the Five Authorities area, the rest of the UK, and Croydon estimates.

Source: Oxera analysis.

5.33 The results from Table 5.4 are further summarised in Figure 5.4 below.

[205] Office for National Statistics (2018), 'GVA (Income approach) by LAD', December.

Figure 5.4 Breakdown of indirect GVA resulting from the Gatwick Baseline by geographic area (2038)



Note: Entries correspond to the Baseline scenario estimates in 2038. Estimates are reported in 2021 prices. Figures for each study area exclude potential overlaps—i.e. the Coast to Capital estimate excludes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon, but the Five Authorities area does not. As a result, the incremental impact in the Coast to Capital LEP includes the impact allocated to Croydon but not that of the Five Authorities area.

Source: Oxera analysis.

5.34 Unlike direct impacts concentrated on site at Gatwick, indirect impacts have a large footprint that extends across the UK. Within the Five Authorities area, the indirect footprint of the airport activities contributes to high employment levels locally, as discussed in section 5A.

Catalytic footprint

5.35 Separate to this assessment, we have conducted an econometric analysis of the relationship between local employment and air passenger traffic for the UK. We present this analysis in detail in Appendix A8. This evidence allows us to estimate the total net impact of an expansion at Gatwick Airport on overall employment in the study area using UK-specific data.

5.36 This analysis was conducted before the COVID-19 pandemic unfolded, and as a result does not factor in the potential effect of the pandemic on the relationship between local employment and air passenger traffic in the UK. As discussed in section 5A, we have assumed for the purposes of our analysis that the effects of the pandemic on the aviation industry and the local economy will have subsided by the time the Project starts generating additional benefits. It is possible that, for some elements of catalytic employment such as corporate headquarters, the relationship between the aviation industry and business location decisions may weaken. For many other parts of catalytic employment such as hotels, this relationship is unlikely to change materially. However, absent any relevant and up-to-date information on how this relationship might evolve in the long term, we have assumed that it will remain constant in the future.

5.37 In order to isolate the catalytic impact, further calculations are needed. In particular, starting with the econometric estimate, we estimate the catalytic footprint of the airport as a whole as follows:

- first, we calculate the total net impact of Gatwick Airport's activities in the local area (stage 1);
- we then convert this into a total employment footprint (stage 2);
- the final catalytic footprint is then the residual of the difference between the total employment footprint and the direct/indirect footprints (stage 3).

5.38 The net employment impacts measure the change in local employment that occurs as a result of the existence of activity related to Gatwick Airport's operations in the local area. They account for the increase in local employment driven by either a decrease in local unemployment and inactivity or an inflow of workers into the area (e.g. workers migrating or commuting into the area for work). They do not include the number of additional jobs that were filled by people switching employers within the area, since at the level of the whole local area these flows offset one another (i.e. when an employee within the Gatwick Diamond changes jobs to work on site at Gatwick Airport, the overall number of people employed is the same). For consistency with the direct and indirect footprint estimates, it is necessary to add back potential job switching within the area to obtain the total footprint impact.[206]

5.39 While the relationship between local employment and air passenger traffic in the UK was assumed to remain constant in the long term, previous forecasts of total local employment in the study area were adjusted by Cambridge Econometrics to reflect the long-term macroeconomic impact of the COVID-19 pandemic.

5.40 Table 5.5 summarises the catalytic footprint calculations discussed above. The details of these net catalytic impact calculations and the methodology applied are discussed further in section 5D.4.

[206] The economic footprint represents all activity associated with a project or activity, irrespective of whether it is displaced from elsewhere.

Table 5.5 Catalytic footprint calculations

	Type of impact	Description
Net total employment impact (C = A - B)	Net direct impact (A)	Increased activity in the area due to Gatwick Airport's operations generating additional local employment in that same area
	Net spillover impact (B)	Reduced activity in other London-area airports (relative to the counterfactual baseline scenario where Gatwick Airport is not operating in the area) implies that a proportion of the additional local jobs would, in any case, have been associated with activity at other London airports
Total employment footprint (E = C / D)	Net total employment (C)	As calculated above
	Share of job switching within the area (D)	As discussed in subsection 5D.2
Catalytic footprint (H = E - F - G)	Total employment footprint (E)	As calculated above
	Direct employment footprint (F)	As discussed in subsection 5C.2
	Indirect employment footprint (G)	As discussed in subsection 5C.2

Source: Oxera.

5.41 From the catalytic employment footprint, we can then estimate the catalytic GVA footprint using the average GVA per job in the South East. Using the average GVA per job in the South East to convert catalytic employment into value added represents a conservative assumption, given that jobs locating close to the airport—for instance, in high-value services—are likely to have a higher-than-average productivity.

5.42 Table 5.6 shows the catalytic impact of the airport as a whole, which totals £4,548m in 2038 (in 2021 prices) and generates 57,900 jobs across the whole Five Authorities area.

Table 5.6 Baseline catalytic footprint

	2019	2029	2032	2038	2047
Catalytic GVA (£m)	**3,850**	**3,731**	**3,943**	**4,548**	**5,783**
of which Gatwick Diamond	1,926	1,840	1,939	2,225	2,804
of which Coast to Capital LEP	3,239	3,110	3,280	3,760	4,737
of which Five Authorities area	3,850	3,731	3,943	4,548	5,783
Catalytic employment	**64,000**	**55,300**	**55,600**	**57,900**	**62,200**
of which Gatwick Diamond	32,000	27,200	27,300	28,300	30,100
of which Coast to Capital LEP	53,900	46,100	46,200	47,900	50,900
of which Five Authorities area	64,000	55,300	55,600	57,900	62,200

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. Figures for each study area include potential overlaps—i.e. the Coast to Capital estimate includes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not.

Source: Oxera analysis.

5.43 In this case, we assess the catalytic footprint of the airport as a whole relative to a situation where there is no activity from Gatwick Airport in the local area.

Absent the airport-related activity, traffic would be redistributed between other London airports,[207] which would result in spillover effects (see item A in Table 5.5 above) from nearby airports (particularly Heathrow and London City). As a result, the net catalytic impact of the airport does not only correspond to direct impacts from Gatwick's activities (see item B in Table 5.5) in the local area around the airport defined as West Sussex (i.e. the county that includes the airport),[208] but would also be distributed more broadly across other counties in the Five Authorities area due to spillover effects (i.e. East Sussex, Surrey, Kent, and Brighton and Hove).

5C.3 The Northern Runway Project's economic footprint

5.44 In this subsection, we consider the effect of the Project on the economic footprint of Gatwick (i.e. the incremental footprint of the Project as the difference between the economic impact of Gatwick Airport with and without the expansion).

5.45 By enabling dual runway operations, the Project would significantly expand capacity at Gatwick Airport and in turn enable additional air traffic to flow through Gatwick and the London aviation system as a whole. As a result, the airport, which was highly utilised especially at peak times before the COVID-19 pandemic and is forecasted to remain so in the Baseline scenario, would be less congested with the Project.

5.46 In forecasting traffic and on-site employment for the Project, ICF has assumed that the relationship between passenger volumes and employment on site remains constant between the existing and additional activities irrespective of the different passenger type mixes implied by the additional activities related to the Project. We have also assumed, as is discussed in more detail in this section, that profitability and supply chains related to additional activities will be similar to those related to existing activities and forecasted activities at the airport under the Baseline scenario.

Direct footprint

5.47 The Project enables Gatwick Airport to increase its overall capacity and to increase passenger and aircraft movements. This extra capacity and traffic translates into an increase in employment on site at Gatwick driven both from GAL itself and from other firms on site.

5.48 Table 5.7 shows the additional effect of the Project on direct GVA and employment. We estimate the added value of the Project by evaluating direct footprint impacts for both the Baseline and the expansion scenario, as shown in subsection 5C.2. The difference between them is attributable to the Project.

[207] For the purpose of this analysis, we assumed that, in the counterfactual without Gatwick Airport, the whole London system would still have the same total capacity such that traffic could be redistributed between other airports.
[208] This point is discussed in more detail in Appendix A8 on the econometric analysis used as a basis for the catalytic impacts estimates.

Table 5.7 The Project direct footprint

	2029	2032	2038	2047
GVA footprint (£m)	75	249	284	324
Employment footprint	1,000	3,100	3,200	3,100

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: GAL, ICF; Oxera analysis.

Indirect footprint

5.49 When the activity of firms located on the airport's premises increases as a result of the Project, so does supply-chain spending, which translates into a higher indirect footprint.

5.50 Table 5.8 shows the additional effect of the Project on the indirect footprint of Gatwick Airport. Values in the table correspond to the difference between the Project and Baseline scenarios. Absent specific information on the Project's impact over Gatwick Airport's supply chain, we assume that the distribution of activity across the different study areas remains constant over the years.

Table 5.8 The Project indirect footprint

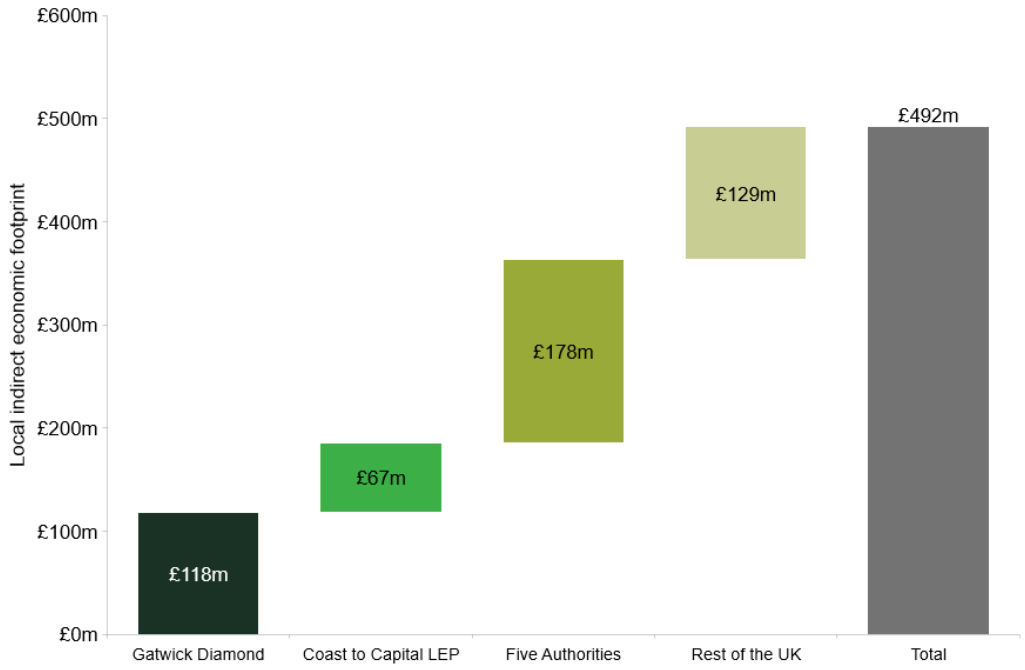
	2029	2032	2038	2047
Indirect GVA (£m)	**130**	**431**	**492**	**563**
of which Gatwick Diamond	31	103	118	135
of which Coast to Capital LEP	49	163	185	212
of which Five Authorities	91	301	343	392
of which the rest of the UK	34	113	129	148
Indirect employment	**1,900**	**6,100**	**6,300**	**6,000**
of which Gatwick Diamond	500	1,500	1,500	1,400
of which Coast to Capital LEP	700	2,300	2,400	2,300
of which Five Authorities	1,300	4,200	4,400	4,200
of which the rest of the UK	500	1,600	1,600	1,600

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. Figures for each study area include potential overlaps—i.e. the Coast to Capital estimate includes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not, such that the total indirect impact corresponds to the sum of the Five Authorities area, the rest of the UK, and Croydon estimates.

Source: Oxera analysis.

5.51 The results from Table 5.8 are further summarised in Figure 5.5 below.

Figure 5.5 Breakdown of indirect GVA resulting from the Project by geographic area (2038)



Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates in 2038. Estimates are reported in 2021 prices. Figures for each study area exclude potential overlaps—i.e. the Coast to Capital estimate excludes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not. As a result, the incremental impact in the Coast to Capital LEP includes the impact allocated to Croydon but not that of the Five Authorities area.

Source: Oxera analysis.

Catalytic footprint

5.52 The methodologies that we used to estimate catalytic impacts for the airport as a whole and for the added value from the Project are similar.[209]

5.53 Table 5.5 in subsection 5C.2 summarises the catalytic footprint calculations discussed above. The details of these net catalytic impact calculations and the methodology applied are discussed further in section 5D.4.

5.54 Table 5.9 below shows the additional Project catalytic impact, which totals £848m in 2038 and generates 10,800 jobs across the whole Five Authorities area.

5.55 Unlike the impact for the whole airport (see the catalytic footprint in section 5C.2), the catalytic footprint of the Project is limited to the Coast to Capital LEP as the impact is concentrated around the airport. This is a result of the lack of spillover (negative) impact from the expansion. As the traffic forecasts predict that most other London airports, including the closer Heathrow and London City, will rapidly reach capacity absent any expansion (i.e. without the Project), the Project would not result in substantial diversion in traffic between London airports (negative spillover impact). Instead, the Project will help to generate an increase in overall capacity in the London system (positive impact). As a result, the catalytic impact of the Project is concentrated in West Sussex where the

[209] The analysis for the baseline assesses the impact for the entire airport, while the analysis of the incremental impact of the Project looks only at what is added over and above the baseline.

airport is located, such that the Coast to Capital and Five Authorities impacts are the same.[210]

Table 5.9 The Project catalytic footprint

	2029	2032	2038	2047
Catalytic GVA (£m)	**260**	**820**	**848**	**918**
of which Gatwick Diamond	150	472	487	527
of which Coast to Capital LEP	260	820	848	918
of which Five Authorities area	260	820	848	918
Catalytic employment	**3,800**	**11,600**	**10,800**	**9,900**
of which Gatwick Diamond	2,200	6,700	6,200	5,700
of which Coast to Capital LEP	3,800	11,600	10,800	9,900
of which Five Authorities area	3,800	11,600	10,800	9,900

Note: Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon, but the Five Authorities area does not.

Source: Oxera analysis.

Box 5.5 Local tourism impacts

The catalytic footprint of the Project could arise through a number of mechanisms. While we do not examine each of these in detail, one obvious way that air connectivity could affect local employment is through stimulating tourism activity. While most people flying to Gatwick Airport intend to go to London, there is likely to be scope for some to stay and visit the local area around the airport in relation to their travel plans (i.e. after arrival or before departure) or as part of a wider visit of the UK.

In addition to the air fares paid by passengers, a tourist visiting the area around Gatwick Airport is likely to spend more widely on accommodation, food and drink and attractions.

While this tourism activity may not be entirely additional to the economy at national level, as with the economic footprint more generally, it could create economic activity in the local area that would not have arisen in the absence of Gatwick Airport. Promotion of regional tourism is the focus of the 'Gateway Gatwick' initiative—a collaboration between Gatwick Airport and its regional partners.[211]

Source: Oxera.

Footprint summary

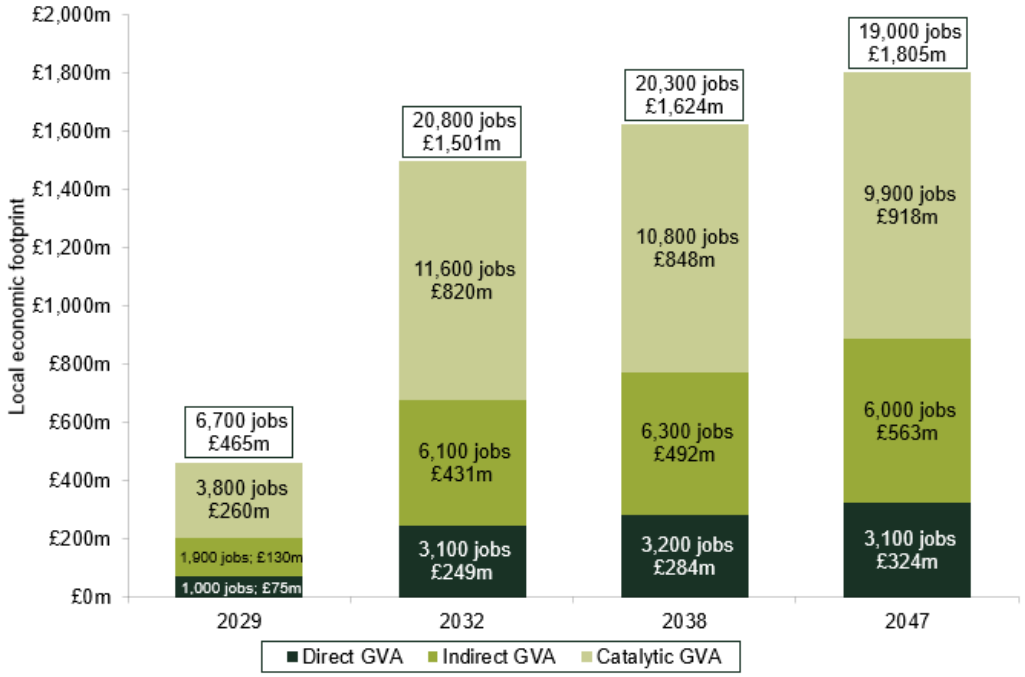
5.56 In this subsection, we summarise the footprint estimates of the Project by showing the footprint split between the three impacts (direct, indirect and catalytic), and the footprint geographic distribution within the study area.

5.57 Figure 5.6 shows the build-up of the additional footprint impact split by type of impact. As discussed in subsection 5C.1, the direct footprint represents a smaller share of the overall footprint (£284m out of a £1.6bn total in 2038), but appears to induce a larger scale of activities further down the supply chain. The impact of the Project increases over time[212] (for example, the passenger increase at Gatwick due to the Project goes from 7% in 2029 to 21% in 2038),

[210] Appendix A8 on the econometric analysis on which this catalytic impact estimation is based discusses in more detail the geographic definition underpinning the elasticity estimates used for the purposes of this analysis.
[211] Gatwick Airport (2021), Local Tourism page available at: https://www.gatwickairport.com/at-the-airport/flying-in/discover-local/
[212] There is a small decrease in overall employment footprint between 2038 and 2047, which is driven by a slight drop in additional traffic brought in by the Project (from 13.1m in 2038 to 13.0m in 2047). Nonetheless, GVA will continue to rise due to the increase of GVA per worker.

as does its overall footprint, which increases from £465m in 2029 to £1.6bn in 2038.

Figure 5.6 The Project footprint analysis as added value over the Baseline scenario (GVA): UK-wide



Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates each year. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. GVA estimates for a particular impact may diverge from the employment estimates over time due to the forecast increase in GVA per worker (ONS TAG).

Source: Oxera analysis.

5.58 As shown in Table 5.10 below, our estimates suggest that the total economic footprint of the Project will be £1.6bn of GVA (in 2021 prices) and 20,300 jobs in 2038. More than half of this would occur within the Gatwick Diamond, with the vast majority being split across the Coast to Capital LEP and the Five Authorities area.

Table 5.10 Contextualising the total economic footprint of the Project in 2038

	Total GVA (£m)	Total employment (direct, indirect and catalytic)
Gatwick Diamond	889	10,900
Coast to Capital LEP	1,317	16,400
Five Authorities area	1,475	18,400
UK	1,624	20,300

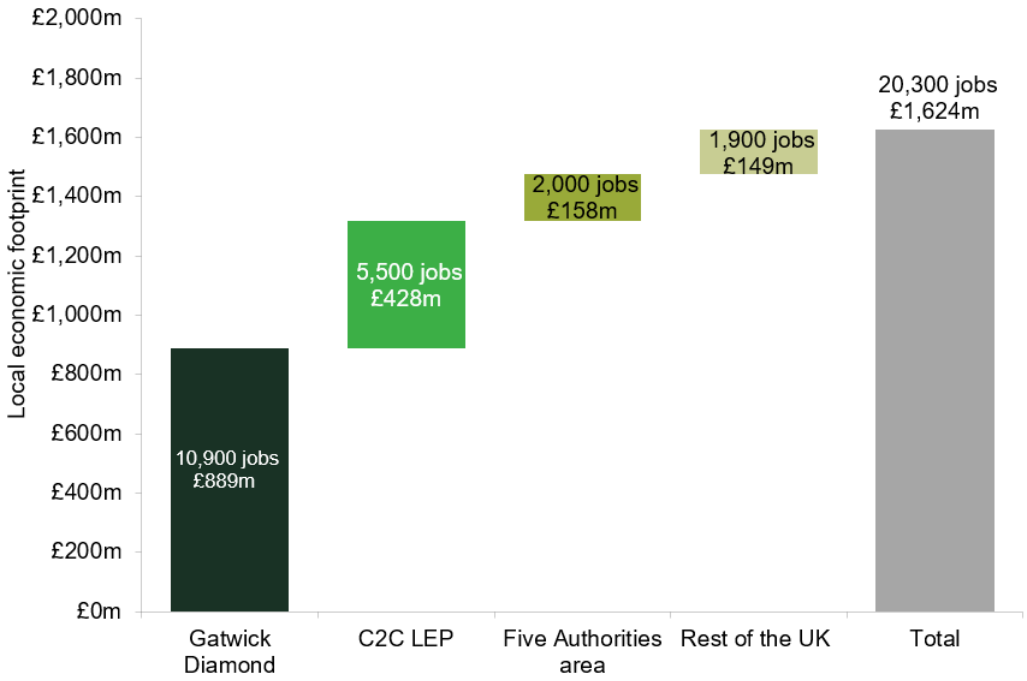
Note: GVA figures for each local study area include potential overlaps (i.e. the Coast to Capital LEP estimates include the GVA footprint of the Gatwick Diamond). Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not.

Source: Oxera.

5.59 Figure 5.7 shows the geographic breakdown of the overall footprint estimates. A significant share of the footprint is located across the Gatwick Diamond

(£889m) and the Coast to Capital LEP (£428m), while the additional value added generated in the Five Authorities area and the rest of the UK is smaller (£158m and £149m respectively). As shown in Table 5.9, the catalytic footprint estimates for the Five Authorities area are the same as those for the Coast to Capital LEP due to catalytic impacts being concentrated in the West Sussex area.

Figure 5.7 Economic footprint of the Project across the study area in 2038



Note: C2C, Coast to Capital. Entries correspond to the difference between the Project estimates and Baseline scenario estimates in 2038. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not. As a result, the incremental impact in the Coast to Capital LEP includes the impact allocated to Croydon but not that of the Five Authorities area.

Source: Oxera analysis.

5.60 Finally, to further put into context the scale of the value added generated in the wider local area (the Gatwick Diamond, the Coast to Capital LEP, and the Five Authorities area) and in the UK as a whole, we translate these GVA estimates into equivalent tax receipts and then into the corresponding number of primary or secondary school places and nurse or police constable positions equivalent to the level of GVA associated with the Project.

5.61 We perform the four steps described below to estimate these benchmarks.

1. We estimate the share of tax take per unit of GVA by calculating the ratio between the total HMRC tax receipts in 2019[213] and GVA for the UK as a whole.[214]

2. With this ratio, we convert GVA generated by the Project as reported in this section into the corresponding tax take.

[213] Statista (2019), 'United Kingdom (UK) total HMRC tax receipts from fiscal year 2000/01 to fiscal year 2018/19'.
[214] Office for National Statistics (2019), 'Gross Value Added (Average) at basic prices: CP SA £m'.

3. Separately, we gather information on:
   a. the cost of opening a primary or secondary school place for a year;[215]
   b. employee compensation (wage and pensions) for a nurse for a year;[216]
   c. employee compensation (wage and pensions) for a police officer for a year.[217]
4. Finally, we divide the equivalent tax take calculated from GVA for the Project by the cost of each item to obtain the number of primary or secondary school places and nurse or police officer positions corresponding to the level of GVA associated with the Project.

5.62 Table 5.11 summarises the results of this benchmarking exercise. Overall, the GVA generated by the Project across the UK in 2038 is comparable to opening 43,200 primary school places or employing 13,600 nurses for a year.

5.63 It should be noted that these benchmarks are only indicative of the scale of the Project, and are generated to contextualise the footprint of the Project.[218]

Table 5.11 Contextualising the Project's total GVA footprint in 2038

	Estimated tax take (£m)	Primary school places	Secondary school places	Nurse positions	Police officer positions
Gatwick Diamond	£284m	23,600	17,200	7,400	5,900
Coast to Capital LEP	£421m	35,000	25,500	11,000	8,700
Five Authorities	£471m	39,200	28,500	12,300	9,700
UK-wide	**£519m**	**43,200**	**31,400**	**13,600**	**10,700**

Note: Benchmarks are reported in units (i.e. number of school places or nurse/police officer positions). Estimated tax take is reported in 2021 prices.

Source: Oxera.

5C.4 The economic footprint of Gatwick Airport with the Project

5.64 In this subsection, we consider the effect of the Project on the economic footprint of Gatwick—i.e. the economic footprint of Gatwick Airport as a whole with the Project.

Direct footprint

5.65 The Project enables Gatwick Airport to increase its overall capacity and to increase passenger volumes. This extra capacity translates into an increase in employment on site at Gatwick driven both from GAL itself and from other firms on site.

5.66 Table 5.12 shows the additional effect of the Project on direct GVA and employment. We estimate the total value of the expansion at Gatwick Airport by evaluating direct footprint impacts for the airport as a whole under the

[215] National Audit Office (2011), 'Capital funding for schools', p. 11.
[216] NHS Trusts and CCGs (2019), 'NHS staff earnings estimates to June 2019'. NHS Employers (2019), 'Pension contributions and tax arrangements', March.
[217] Home Office (2017), 'Factsheet: Police Welfare, Pay and Wellbeing – September 2017', September.
[218] These figures are provided for illustration of the scale of tax revenue that would be associated with the GVA footprint if that footprint generated tax at the average level for the UK as a whole. These figures are not the result of a detailed examination into the actual tax revenues generated in the supply chain.

Project, accounting for additional passenger volumes and direct employment on site.

Table 5.12 Direct footprint of Gatwick Airport with the Project

	2019	2029	2032	2038	2047
GVA footprint (£m)	1,656	2,169	2,486	2,821	3,432
Employment footprint	24,100	28,600	31,200	32,000	32,800

Note: Entries correspond to the Project estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: GAL, ICF; Oxera analysis.

5.67 The Project will also create a temporary requirement for workers between 2024 and 2039 during the construction phase. On the basis of the preliminary construction plans, there would be a peak in construction workforce at around 1,300 workers in 2026. This peak will be short in duration with on average 450 construction workers on site during the period 2024–39.

Indirect footprint

5.68 When the activity of firms located on the airport's premises increases as a result of the Project, so does supply-chain spending, which translates into a higher indirect footprint.

5.69 Table 5.13 shows the effect of the indirect footprint of Gatwick Airport with the Project.[219]

Table 5.13 Indirect footprint for Gatwick Airport with the Project

	2019	2029	2032	2038	2047
Indirect GVA (£m)	**2,874**	**3,762**	**4,312**	**4,894**	**5,954**
of which Gatwick Diamond	689	902	1,033	1,173	1,427
of which Coast to Capital LEP	1,082	1,417	1,624	1,843	2,242
of which Five Authorities	2,003	2,623	3,006	3,412	4,150
of which the rest of the UK	754	987	1,131	1,283	1,561
Indirect employment	**47,800**	**55,700**	**60,800**	**62,300**	**64,000**
of which Gatwick Diamond	11,500	13,400	14,600	14,900	15,300
of which Coast to Capital LEP	18,000	21,000	22,900	23,500	24,100
of which Five Authorities	33,300	38,800	42,400	43,500	44,600
of which the rest of the UK	12,500	14,600	15,900	16,300	16,800

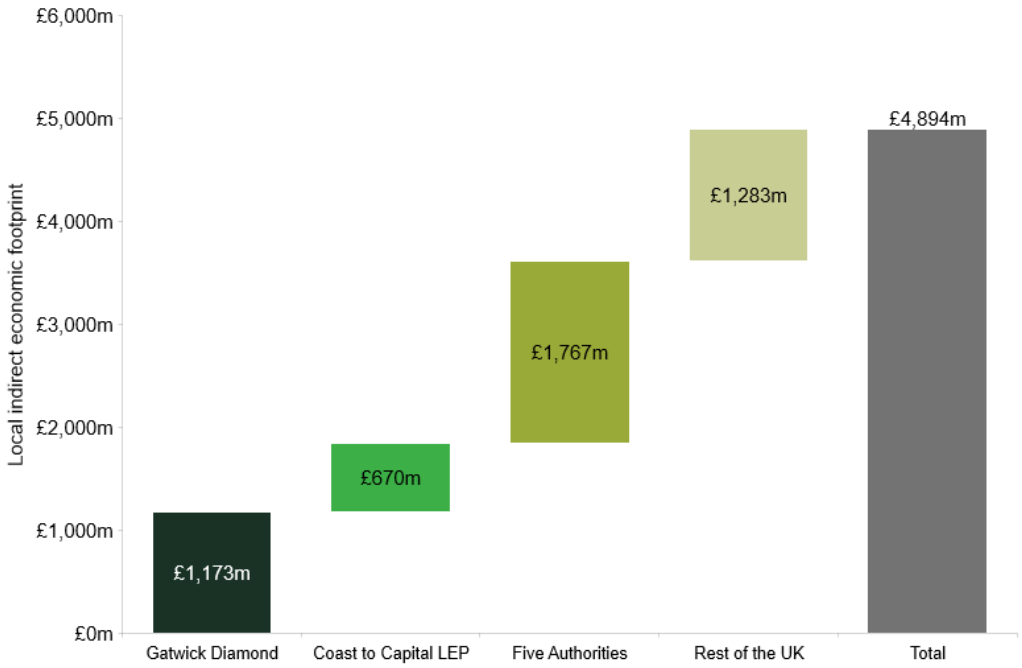
Note: Entries correspond to estimates for Gatwick Airport with the Project. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. Figures for each study area include potential overlaps—i.e. the Coast to Capital estimate includes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon but the Five Authorities area does not, such that the total indirect impact corresponds to the sum of the Five Authorities area, the rest of the UK, and Croydon estimates.

Source: Oxera analysis.

5.70 The results from Table 5.13 are further summarised in Figure 5.5 below.

[219] Absent specific information on the Project's impact over Gatwick Airport's supply chain, we assume that the distribution of activity across the different study areas remains constant over the years.

Figure 5.8 Breakdown of indirect GVA for Gatwick Airport with the Project by geographic area (2038)



Note: Entries correspond to estimates for Gatwick Airport with the Project in 2038. Estimates are reported in 2021 prices. Figures for each study area exclude potential overlaps—i.e. the Coast to Capital estimate excludes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon, but the Five Authorities area does not. As a result, the incremental impact in the Coast to Capital LEP includes the impact allocated to Croydon but not that of the Five Authorities area.

Source: Oxera analysis.

Catalytic footprint

5.71 Gatwick Airport's catalytic footprint with the Project corresponds to the sum of Project's incremental catalytic footprint as reported in subsection 5C.3 and the Baseline catalytic footprint as reported in section 5C.2.

5.72 Table 5.14 shows the effect of the catalytic footprint of Gatwick Airport with the Project.

Table 5.14 Catalytic footprint for Gatwick Airport with the Project

	2019	2029	2032	2038	2047
Catalytic GVA (£m)	**3,850**	**3,991**	**4,763**	**5,397**	**6,701**
of which Gatwick Diamond	1,926	1,990	2,411	2,712	3,331
of which Coast to Capital LEP	3,239	3,370	4,100	4,609	5,656
of which Five Authorities	3,850	3,991	4,763	5,397	6,701
Catalytic employment	**64,000**	**59,100**	**67,100**	**68,700**	**72,000**
of which Gatwick Diamond	32,000	29,500	34,000	34,500	35,800
of which Coast to Capital LEP	53,900	49,900	57,800	58,700	60,800
of which Five Authorities	64,000	59,100	67,100	68,700	72,000

Note: Entries correspond to estimates for Gatwick Airport with the Project. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. Figures for each study area include potential overlaps—i.e. the Coast to Capital

estimate includes the Gatwick Diamond. As shown in Figure 3.5, the Coast to Capital LEP area includes the London Borough of Croydon, but the Five Authorities area does not.

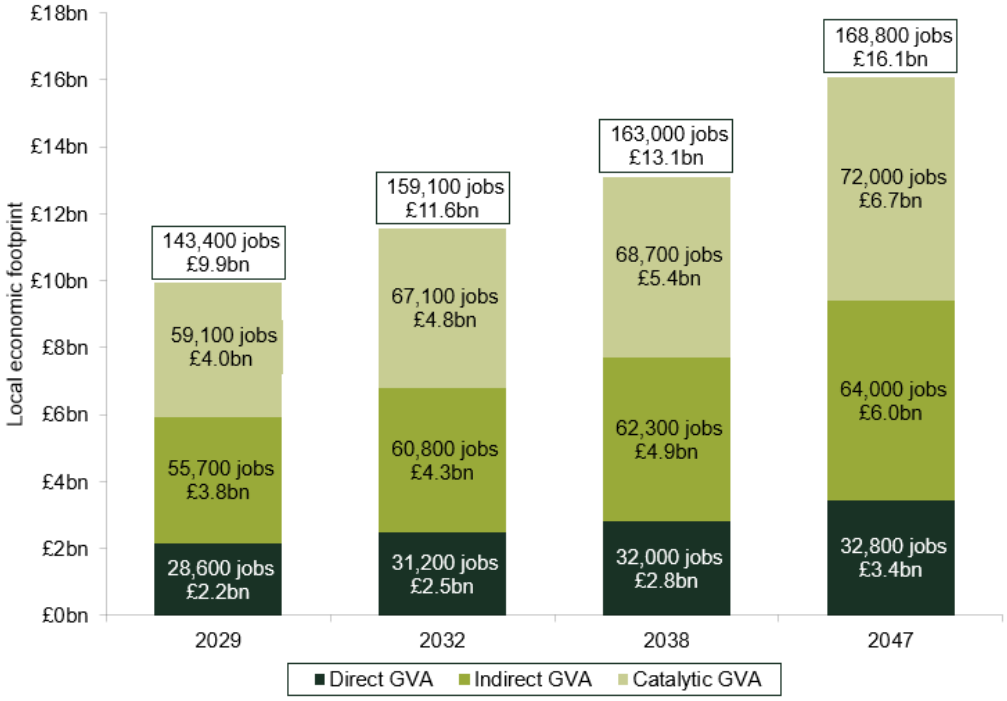
Source: Oxera analysis.

Footprint summary

5.73 Our estimates suggest that the total economic footprint of Gatwick with the added benefits of the Project will be £13.1bn of GVA (in 2021 prices) and 163,000 jobs in 2038.

5.74 Figure 5.9 shows the build-up of the overall footprint impact of Gatwick Airport with the Project split by type of impact. As discussed in subsection 5C.1, the direct footprint represents a smaller share of the overall footprint (£2.8bn out of £13.1bn in total in 2038), but appears to induce a larger scale of activities further down the supply chain. The impact of Gatwick Airport with the Project increases over time (for example, passenger growth at Gatwick due to the Project goes from 7% in 2029 to 21% in 2038), as does its overall footprint, which increases from £9.9bn in 2029 to £13.1bn in 2038.

Figure 5.9 Gatwick Airport with the Project footprint analysis: UK-wide



Note: Entries correspond to estimates for Gatwick Airport as a whole with the Project each year. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

5D Net economic impacts

5.75 In this section, we discuss the net economic impact of the Project on the three local study areas (the Gatwick Diamond, the Coast to Capital LEP area, and the Five Authorities area).

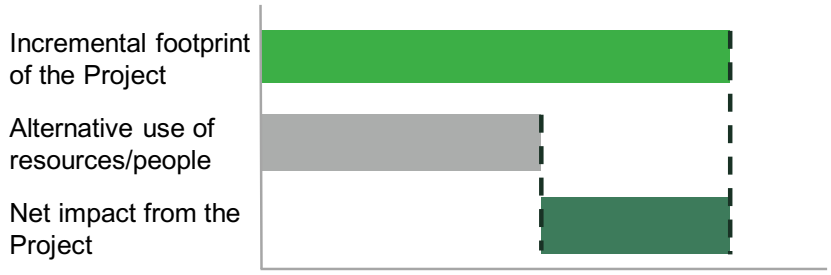
5.76 We assess how the airport drives greater productivity, and the mechanisms by which this occurs. To do this, we compare Gatwick's operations in the baseline with the level of activity projected with the Project. We estimate the effect on employment of the incremental activity generated by the Project on top of the activity captured in the baseline.

5.77 As discussed in section 2C.2, this analysis focuses on the value added and employment generated by the Project that would not have taken place otherwise within the Five Authorities area. To do so, it accounts for the alternative use of resources and people absent the Project.

5.78 For example, a job created at the airport due to the expansion may be taken up by a person who would otherwise be in employment somewhere else in the local area. In this example, this additional job is part of the incremental footprint of the Project (i.e. the increase in employment due to the Project relative to the baseline). However, this job is excluded from the net impact of the Project (i.e. it does not increase employment in the Five Authorities area, since the person switched jobs or would have gained a job in any case within the area).

5.79 The difference between these two estimates is shown in Figure 5.10 below. This approach represents standard practice in economic appraisal.[220]

Figure 5.10 Illustration of net economic impact



Source: Oxera.

5.80 As shown in Table 5.15 below and Figure 3.3 in subsection 3A, the net impacts analysis is focused on three impacts: impacts on labour supply, productivity improvements, and catalytic impacts. We discuss each of these in turn in the following subsections.

Table 5.15 Net impacts overview

	Type of impact	Analysis
Net economic impacts	Labour supply	Net economic impacts on jobs in the study area (i.e. the net increase in local employment and GVA as a result of the Project)
	Job productivity	Additional productivity generated by jobs related to airport activities (i.e. the increase in GVA associated with workers switching jobs to work in activities related to the airport as a result of the Project)
	Catalytic net impacts	Net impact of firms' location or expansion decisions as a result of the Project

Source: Oxera.

5D.1 Net economic impacts overview

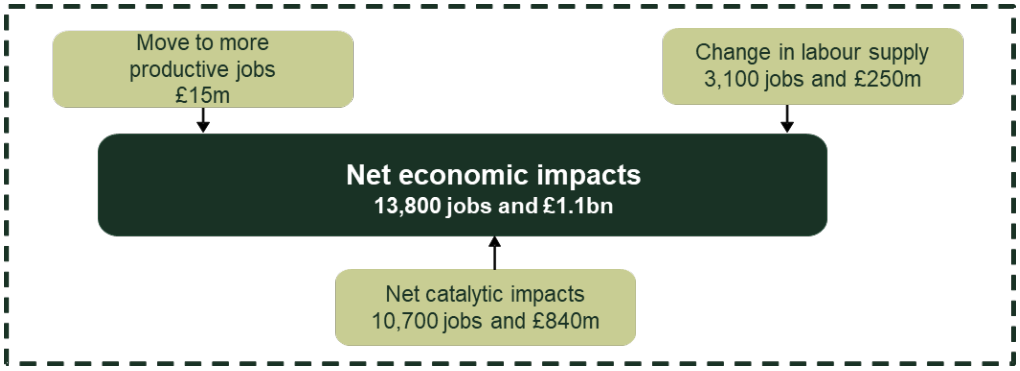
5.81 While the footprint analysis shows the extent to which Gatwick activities will increase as a consequence of the Project, the footprint does not take into account the alternative uses that resources and people could have absent the Project. This is why we extend the analysis to estimate the net impact of the Project. As a result, net impact estimates should be interpreted as the added value and employment generated within the Five Authorities area above and beyond that which would have taken place otherwise (i.e. net of any internal

[220] Department for Transport (2019), 'TAG UNIT A2.3 Employment effects', TAG, May.

displacement of resources and people towards airport-related activity due to the expansion).

5.82 Figure 5.11 gives an overview of the estimated net impact of the Project in terms of jobs and GVA. Our estimates suggest that the Project will result in a net increase of 13,800 jobs and £1.1bn in GVA (in 2021 prices) across the Five Authorities area by 2038.

Figure 5.11 The Project net economic impact overview (2038 estimates)



Note: Figures relate to the Five Authorities area. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. Comparisons to other firms are to those firms' direct employment only, to inform the scale of impacts.

Source: Oxera.

5D.2 Labour supply impact

5.83 The labour supply impacts are the increase in employment and GVA in the South East in airport-related activities (linked to direct and indirect impacts) due to the Project and leading to an increase in the available employment in the South East area.[221]

5.84 To measure the effect of the Project on employment and GVA in labour supply in the South East for airport-related activities, we gathered evidence from studies on employment outcomes after a firm or factory closure, and workers' responses to employment shocks in the UK. The evidence that we reviewed includes studies based on surveys of former workers following employment shocks such as the MG Rover factory closure in the Birmingham area.[222] While this literature review provided insight into the overall mechanics of labour market outcomes, it also highlighted some uncertainty about the scale of a particular outcome in each setting. Depending on characteristics such as the geographic area, the time span, the relevant job sector and the type of employment shock considered, the effect of a shock on unemployment, inactivity or other factors can vary considerably.

Labour market outcomes of a local job expansion

5.85 As a result of the Project, additional jobs would be created in airport-related activities in the wider study area. To respond to this rise in local labour demand, labour supply would respond to some extent through various mechanisms, some of which are related to an increase in net labour supply.

[221] In this context, we are assessing the increase in available employment in the study area (the Five Authorities area) on a workplace basis (i.e. people finding employment located within the study area).
[222] The Work Foundation (2008), 'Life after Longbridge: Three Years on. Pathways to re-employment in a restructuring economy', November.

5.86 It is possible to categorise the overall labour market response to a rise in local labour demand in one of five ways:

- a reduction in unemployment;
- a reduction in economic inactivity;
- an increase in in-migration;[223]
- an increase in in-commuting;
- internal job switching.

5.87 These mechanisms have different impacts on net labour supply across the wider study area:

- **no impact on labour supply** (not included in the net labour supply impact) such as a reduction in unemployment or internal job switching, since these mechanisms do not affect the number of economically active individuals who are willing to supply labour locally; or
- **an increase in local labour supply** (included in the net labour supply impact) such as a reduction in economic inactivity, an increase in in-commuting or an increase in in-migration, since these contribute to increasing the potential local labour supply.

5.88 The relative importance of each impact might vary depending on factors such as the sector and occupational level of the jobs created, and the characteristics of the local labour market. This is reflected in the studies reviewed in our analysis, which are summarised in Table 5.16 below.

Table 5.16 Summary of literature review

Source	Type of shock	Unemployment (1)/ inactivity (2)		Commuting (3)/ migration (4)	
		(1)	(2)	(3)	(4)
Life after Longbridge (2008)	Factory closure	7%	4%	40%	n.a.
Life after MG Rover (2006)	Factory closure	39%	n.a.	n.a.	26%
Placing Labour Markets in the Evolution of Old Industrial Regions: the Case of Northern Rock (2012)	Firm closure	23%	n.a.	n.a.	2%
Mining closure, gender and employment reallocations: the case of UK coal mines (2015)	Mining closure	No effect	n.a.	n.a.	n.a.
Coalfields and neighbouring cities: Economic regeneration, labour markets and governance (2007)	Mining closure	1.2–5.3%	9.9–11.6%	2.2–5.7%	0.3–4.1%
Adjustment to Job Loss in Britain's Major Cities (2000)	No specific shock	1.0–4.6%	11.3–45.2%	20.0–48.2%	28.0–38.3%
2011 ONS data (census and other sources)	No specific shock	3.2%	18.5%	15.0–23.8%	18%

Note: The employment impacts described in the table correspond to varying lengths of time between the shock and the measured response. As a result, the same effect in the same

[223] In the cases of in-migration and in-commuting, we are considering the net inflows of people (e.g. the difference between in-migration and out-migration). As a result, an increase in in-migration can both translate an increase in the gross inflow of people and a decrease in the gross outflow of people.

population (e.g. MG rover in 2006 and 2008) can vary in magnitude (e.g. unemployment at 39% after six months and at 7% after three years).

Source: Oxera analysis based on a literature review of the following reports:

The Work Foundation (2008), 'Life after Longbridge: Three Years on. Pathways to re-employment in a restructuring economy', November; The Work Foundation (2006), 'Life after MG Rover. The Impact of the Closure on the Workers, their Families and the Community', March; Dawley, S., Marshall, N., Pike, A., Pollard, J. and Tomaney, J. (2012), 'Placing Labour Markets in the Evolution of Old Industrial Regions: the Case of Northern Rock', Centre for Learning and Life Chances in Knowledge Economies and Societies; Aragón, F., Rud, J. and Toews, G. (2015), 'Mining closure, gender and employment reallocations: the case of UK coal mines', OxCarre Working papers 161, Oxford Centre for the Analysis of Resource Rich Economies, University of Oxford; Gore, T., Fothergill, S., Hollywood, E., Lindsay, C.D., Morgan, K., Powell, R. and Upton, S. (2007), 'Coalfields and neighbouring cities. Economic regeneration, labour markets and governance', Joseph Rowntree Foundation; Bailey, N. and Turok, I. (2000), 'Adjustment to Job Loss in Britain's Major Cities', *Journal of Regional Studies*, **34**:7, pp. 631–653; Office for National Statistics (2011), '2011 Census Origin Destination'.

5.89 For instance, we found that the occupational level was particularly relevant in assessing how likely prospective workers were to commute into the area for work. Studies[224] based on ONS census data show that high-skilled workers tend to commute within larger areas than low-skilled workers. The ONS defines travel to work areas (TTWAs) as self-contained areas in which most residents also work. This analysis suggests that there are more than two and half times as many TTWAs for workers with low qualifications (416) than TTWAs for workers with high qualifications (153), and that the labour market for workers with higher qualifications is geographically wider. Other studies that are part of the literature review support the idea that low-skilled workers are less likely to commute further for work than high-skilled workers.[225]

5.90 To reflect these findings, we separate on-site jobs at Gatwick Airport between low-skilled and high-skilled jobs, as explained in Box 5.6 below.

[224] Office for National Statistics (2016), 'Travel to work area analysis in Great Britain: 2016'.
[225] GLA Economics for Transport for London (2009), 'Commuting patterns in London by qualification level and employment location', Working Paper 36. Joseph Rowntree Foundation (2006), 'Geography of poor skills and access to work'.

Box 5.6 Job classification at Gatwick

Our literature review on the effect on local labour markets of a local employment shock shows a relevant distinction between outcomes for high-skilled and for low-skilled workers,[226] especially in their propensity to commute outside the local area for work. We aim to apply these findings to our analysis of the economic impact of the Project. This requires us to categorise the jobs created by the Project based on skill level. For simplicity, we restrict this categorisation to two groups: high-skilled and low-skilled.

Additional jobs that are directly related to airport activity comprise direct employment (GAL and non-GAL jobs located on the Gatwick campus) and indirect employment (jobs associated with the supply chain of firms on site). For the former, ICF has estimated direct employment by occupation category, which allows us to separate high-skilled and low-skilled jobs, as discussed further below. For the latter, no specific indication is available on the type of skills associated with jobs in the Gatwick Airport supply chain. Given the types of businesses that are present on site (e.g. duty-free shops, restaurants, car rentals, hotels), we assume that suppliers operate in wholesale retail and manufacturing, and represent mainly low-skilled jobs.

For direct employment, we match ICF occupational categories to the ONS Standard Occupational Classification (SOC) hierarchy,[227] as shown in the table below. Occupations at the top of the hierarchy (Major Groups 1 to 3) as well as Air Cabin Crew staff (who are considered to be very mobile given the nature of their work) are considered to be high-skilled jobs and therefore more likely to commute further. The rest of direct employment is considered to be low-skilled and is assigned a lower proportion of commuting (half of the high-skilled jobs commuting share).

This broad split of direct employment at Gatwick Airport according to skill level is a way to differentiate between workers who are more and less likely to commute far to work on site. Although this skill breakdown is relevant for our analysis, we rely on an existing occupational hierarchy from the ONS and apply no specific value judgement to establish it. It does not reflect Oxera's views on which on-site occupations can be associated with high/low levels of skill for other purposes.

ICF occupation categories	ONS SOC Major Group	Group number	Skill category
Air Cabin Crew	Caring, leisure and other service occupations	6	High
Airline/Airport Management	Managers, directors and senior officials	1	High
Apron, Ramp, Cargo, Baggage Handling and Drivers	Process, plant and machine operatives	8	Low
Catering, Cleaning and Housekeeping	Elementary occupations	9	Low
Customs, Immigration, Police and Fire Staff	Associate professional & technical occupations	3	High
Information Technology	Professional occupations	2	High
Maintenance Tradesmen	Skilled trades occupations	5	Low
Management and Professional - General	Managers, directors and senior officials	1	High
Passenger Services/Sales and Clerical Staff	Sales and customer service occupations	7	Low
Pilots/Air Traffic Control/Flight Operations	Associate professional & technical occupations	3	High
Security, Passenger Search, Security Access Control	Elementary occupations	9	Low

Source: Oxera analysis.

[226] While our literature review highlighted a relevant distinction in commuting patterns between types of workers, these distinctions exist on average between types, such that in reality living and working arrangements can vary between workers within the same occupation category.
[227] Office for National Statistics, ONS Standard Occupational Classification (SOC) Hierarchy, https://onsdigital.github.io/dp-classification-tools/standard-occupational-classification/ONS_SOC_hierarchy_view.html, accessed 9 April 2021.

5.91 As discussed in Box 5.6 above, a variety of skills levels are required to match the different categories of employment on site at Gatwick Airport. While educational attainment is high in the Five Authorities Area, and particularly in the Gatwick Diamond (see section 5A on the local economic baseline), occupation categories represented on site at the airport offer local employment opportunities for individuals with varied skill sets.

5.92 Table 5.17 below shows the employment outcomes assumed for the labour supply impact analysis. The assumptions are based on evidence from our literature review, but it is necessary to use an element of judgement to interpret and apply that literature. In recognition of the uncertainty around these assumptions, we conduct a sensitivity analysis to investigate how responsive the results are to a range of possible interpretations of the evidence.

5.93 Internal job-switching (i.e. internal displacement) within the study area is defined as the residual impact when all others are accounted for. To reflect the mixed evidence on the magnitude of the different responses, we undertake a sensitivity around the impact of the job expansion on unemployment to reflect the uncertainty on the share of jobs created by the Project that would be filled by unemployed workers. We assume a 10% unemployment impact (i.e. 10% of additional jobs in the expansion would be filled by currently unemployed individuals), and sensitivity tests change this assumption to 5–15% to provide an interval of estimates reflecting the uncertainty around this assumption.

5.94 We also adopt differing assumptions for the commuting responses for the different study areas in order to reflect their differing geographic areas. In particular, we assume that no inward commuting to direct jobs on the Gatwick site would occur from outside the Coast to Capital LEP.

Table 5.17 Employment outcomes of the Project

	High-skilled jobs	Low-skilled jobs
Reduced economic inactivity	5%	5%
Reduced unemployment (sensitivity)	10% (5–15%)	10% (5–15%)
Increased in-migration	5%	5%
Increased in-commuting	20–40%	10–20%
of which Gatwick Diamond	40%	20%
of which Coast to Capital LEP	20%	10%
of which Five Authorities area	20%	10%
Switching jobs within the area	40–60%	60–70%
of which Gatwick Diamond	40%	60%
of which Coast to Capital LEP	60%	70%
of which Five Authorities area	60%	70%

Source: Oxera analysis from the literature review.

5.95 The literature review on which these employment outcomes are based was undertaken before the COVID-19 pandemic unfolded, and as a result does not reflect the potential effects of the pandemic on labour market outcomes following a local job expansion. Absent any relevant and up-to-date information on how the pandemic may affect the labour supply decisions of individuals, we have assumed that these employment outcomes will remain unchanged in the long run.

Labour supply impact of a local job expansion

5.96 Evidence from our literature review, combined with Gatwick Airport's direct and indirect employment numbers from the footprint analysis in subsection 5C, allows us to estimate the number of additional jobs generated by the Project through airport-related activities that would not otherwise exist within the Five Authorities area. GVA per job for each category of employment in the study area (the Five Authorities area) is used to convert the estimated employment outcomes into GVA figures. Direct GVA per job is calculated as the total direct GVA divided by the number of direct jobs, and indirect GVA per job corresponds to indirect GVA divided by the number of indirect jobs (using the South East average GVA per job as discussed in subsection 5C).

5.97 Table 5.18 shows the results of this analysis. As the analysis focuses on the local impact of the Project (i.e. how the additional jobs created by it would be sourced within the study area), the whole labour supply impact is captured within the Five Authorities area.

Table 5.18 The Project's net labour supply impact as incremental value over the Baseline scenario

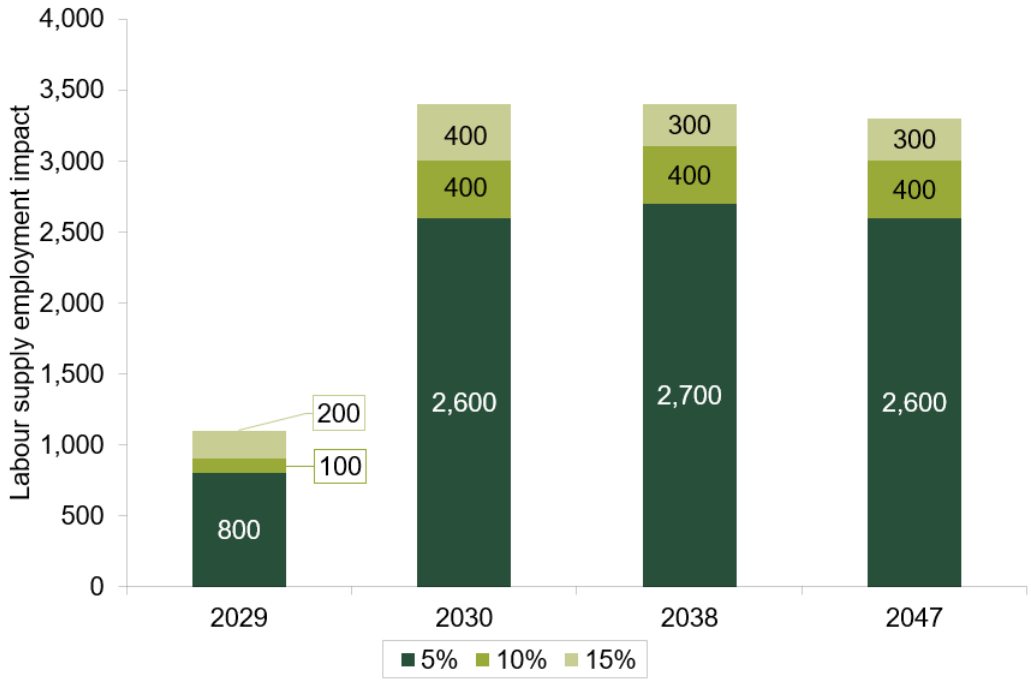
	2029	2032	2038	2047
Labour supply GVA (£m)	**66**	**220**	**250**	**286**
of which Gatwick Diamond	48	161	183	209
of which Coast to Capital LEP	54	179	203	232
of which Five Authorities area	66	220	250	286
Labour supply employment	**900**	**3,000**	**3,100**	**3,000**
of which Gatwick Diamond	700	2,200	2,200	2,100
of which Coast to Capital LEP	800	2,400	2,500	2,400
of which Five Authorities area	900	3,000	3,100	3,000

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. These estimates assume a 10% unemployment impact on labour supply. Estimates are reported in 2021 prices. Employment figures are expressed as headcount. Values may not sum due to rounding.

Source: Oxera analysis.

5.98 Figure 5.12 shows the effect of the sensitivity test to vary the unemployment impact on the resulting total labour supply impact over the whole study area (the Five Authorities area). As the sensitivity shows, adopting different assumptions has a limited impact on the overall labour supply impact.

Figure 5.12 Sensitivity of labour supply impact on the share of unemployment impact



Source: Oxera.

5D.3 Job productivity change

5.99 To the extent that the productivity of jobs at Gatwick Airport is different from that in the rest of the local labour market, an expansion in employment at the airport can lead to a change in overall labour productivity in the local study area.

5.100 Using the estimates from the labour supply impacts in section 5D.2 above, we obtain the number of jobs that would have remained in the South East in the Baseline case.[228] We then calculate the difference between the GVA per job on site at Gatwick (estimated in the footprint analysis in subsection 5C) and the GVA per job in the South East based on ONS data. This productivity differential is then assumed to apply to all direct jobs associated with the airport. Since we have assumed in subsection 5C.2 that indirect jobs are as productive as other average jobs in the South East region (and we have therefore used the South East average GVA per job to estimate the indirect GVA), there is no implied productivity differential for indirect jobs.

5.101 The job productivity impact is focused on increased productivity for a given level of employment; in other words, we do not assume any net change in employment resulting from this impact. Instead, the benefit comes from employees switching jobs.

5.102 Table 5.19 shows the estimated job productivity impact benefits of £4m in 2029 increasing to £15m in 2038. These results effectively mean that, of those people employed on site at Gatwick Airport who would have had another job in the local area without the Project, their involvement in airport-related activities would make them more productive and would contribute to generating additional value up to £15m by 2038 over and above what they would have

[228] Calculated as the residual corresponding to the number of workers who would change jobs within the study area to work at Gatwick Airport if the Project were implemented.

produced without the Project. As discussed above, the productivity gain is restricted to direct jobs located on site (for which GVA per job is higher than average). As a result, the impact is of the same size across all three study areas (the Gatwick Diamond, the Coast to Capital LEP, and the Five Authorities area).

Table 5.19 The Project net productivity impact

	2029	2032	2038	2047
Productivity impact GVA (£m)	4	13	15	17

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices.

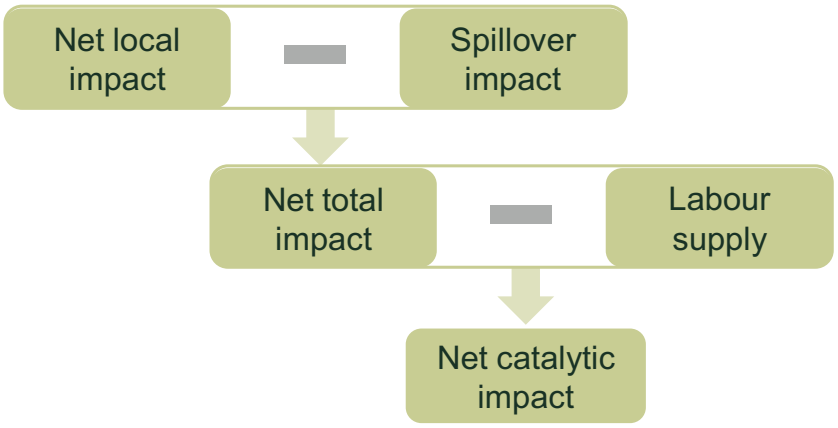
Source: Oxera analysis.

5D.4 Net catalytic impacts

5.103 **Net catalytic impacts** arise when firms choose to expand or locate close to the airport because of the connectivity that it creates.[229] In the absence of the Project, many of these additional jobs would be expected to locate or expand close to another airport instead.[230]

5.104 We estimate the catalytic net impacts in two stages, as shown in Figure 5.13.

Figure 5.13 Illustration of net catalytic impact estimations



Note: Net local and spillover impacts are derived from Oxera's econometric analysis.

Source: Oxera analysis.

5.105 Table 5.20 below summarises the following steps in the calculation of net catalytic impacts.

- First, we calculate the local employment impact of the Project when increased passenger volumes related to the Project generate additional jobs in the Gatwick Diamond and the wider area. This figure represents the totality of the employment impact regardless of its source.
- We also calculate the spillover effects on local employment of reduced passenger volumes at other London-area airports close to the study area

[229] This analysis was conducted before the COVID-19 pandemic unfolded, and as a result does not factor in the potential effect of the pandemic on the relationship between local employment and air passenger traffic in the UK. For a more in-depth discussion of the potential effect of the pandemic on catalytic impacts, please refer to section 5C.2.
[230] This is slightly offset by the small increase in jobs that would arise in the South East from firms that may locate around other London-area airports in the absence of the Project.

(i.e. Heathrow and London City). In forecast scenarios for the Project, additional capacity at Gatwick Airport translates into delayed passenger traffic increases for other London-area airports (Heathrow, London City, Stansted, Luton and Southend) as overall capacity in London adjusts. If the Project did not happen, higher passenger volumes at other airports would generate additional activity (provided they have the capacity to accommodate them), which would in turn attract workers from the study area who would take up jobs at other London airports. This second stage evaluates the number of jobs that would have been lost in the local area (within the Five Authorities) to the London area without the Project. The total employment impact of the Project is then the difference between the direct and spillover employment impacts of the Project on the local area. In this instance, ICF forecasts suggest very little diversion of passengers from other airports, such that we estimate very limited spillover effects in our analysis.

- The last stage, once we have estimated the net total employment impact of the Project, is to calculate the net catalytic impact as the residual from the difference between total employment impacts and labour supply impacts in the study area.

5.106 As discussed in section 5C.2, the econometric analysis on which catalytic impact estimates are based (see Appendix A8 for additional information) was conducted before the COVID-19 pandemic unfolded, and as a result does not factor in the potential effect of the pandemic on the relationship between local employment and air passenger traffic in the UK.

5.107 We have assumed for the purposes of our analysis that most of the effects of the pandemic on the aviation industry and the local economy will have subsided by the time the Project starts generating additional benefits. This relationship may become weaker in the post-COVID-19 environment if the pandemic brings about structural changes in economic relationships between employment and activity. This may therefore overstate the extent of catalytic impacts. However, many businesses that chose to locate close to the airport because of the business opportunities that it offers are likely to continue to do so: for example, hotels and other leisure businesses cannot relocate, and international headquarters are likely to continue to benefit from international travel, even if this is to a lesser extent than before the COVID-19 pandemic. Therefore, it is highly likely that catalytic employment will remain a key part of the economic impact of Gatwick Airport over the period of assessment.

Table 5.20 Net catalytic impact calculations

	Type of impact	Description
Net total employment impact (C = A – B)	Net direct impact (A)	Increased activity from the airport expansion in the area, generating additional local employment in that same area
	Net spillover impact (B)	Reduced activity in other London-area airports (relative to the counterfactual Baseline scenario) implies that part of the additional local jobs would have been associated with activity at other London airports
Net catalytic impact (E = C – D)	Net total employment (C)	As calculated above
	Net labour supply impact (D)	As discussed in section 5D.2

Source: Oxera.

5.108 The net catalytic GVA from our catalytic employment can then be estimated using average GVA per job in the South East. As discussed in subsection 5C.2, the average GVA per job in the South East is a conservative assumption, given that catalytic jobs (e.g. jobs in high-value services) are likely to be more productive than average.

5.109 Our analysis contains an important geographic dimension:

- the local employment (positive) impacts of the Project estimate the effect of the expansion within the immediate region in which the airport is located (which for the purpose of this analysis is defined as the county that includes Gatwick Airport—i.e. West Sussex);
- the spillover (negative) employment impacts of the Project estimate the effect in the wider study area (i.e. in each of the five counties in the Five Authorities area: West Sussex, Kent, Surrey, East Sussex, and Brighton and Hove) of a counterfactual scenario in which the Project is not completed.

5.110 Once we have calculated the total net catalytic GVA and employment impacts, we disaggregate them into impacts for each of the study areas using local employment estimates from Cambridge Econometrics. Cambridge Econometrics has produced employment forecasts in each LAD within the study area.[231] We aggregate these forecasts into county-level estimates then calculate the share of each county's total employment located within each study area (for example, 50% of West Sussex employment is located in the Gatwick Diamond, and 100% is located in the Coast to Capital LEP). These shares allow us to break down local and spillover impacts by county into values for each study area.

5.111 As discussed above, all of the local (positive) impact corresponds to the county of West Sussex, while spillover (negative) impacts are estimated for all five counties. As the traffic forecasts predict that most other London airports, including the closer Heathrow and London City, will rapidly reach capacity absent any expansion, the Project would not result in substantial diversion in traffic between London airports (negative spillover impact) but instead in an increase in overall capacity in the London system (positive impact). As a result, the catalytic impact of the Project is concentrated in West Sussex where the airport is located, such that the Coast to Capital and Five Authorities impacts are the same—as shown in Table 5.21 below.

5.112 This underlying dynamic is the same as the incremental catalytic footprint of the Project discussed in section 5C.3. The incremental catalytic footprint of the Project comes in addition to the existing catalytic footprint of the airport as a whole that exists throughout the Five Authorities area, as set out in section 5C.2.

[231] These total local employment forecasts for the study area were adjusted by Cambridge Econometrics to reflect the up-to-date macroeconomic trends following the COVID-19 pandemic.

Table 5.21 The Project catalytic net impacts as incremental value over the base scenario

	2029	2032	2038	2047
Catalytic GVA (£m)	**240**	**781**	**840**	**929**
of which Gatwick Diamond	124	404	434	479
of which Coast to Capital LEP	240	781	840	929
of which Five Authorities	240	781	840	929
Catalytic employment	**3,500**	**11,000**	**10,700**	**10,000**
of which Gatwick Diamond	1,800	5,700	5,500	5,100
of which Coast to Capital LEP	3,500	11,000	10,700	10,000
of which Five Authorities	3,500	11,000	10,700	10,000

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

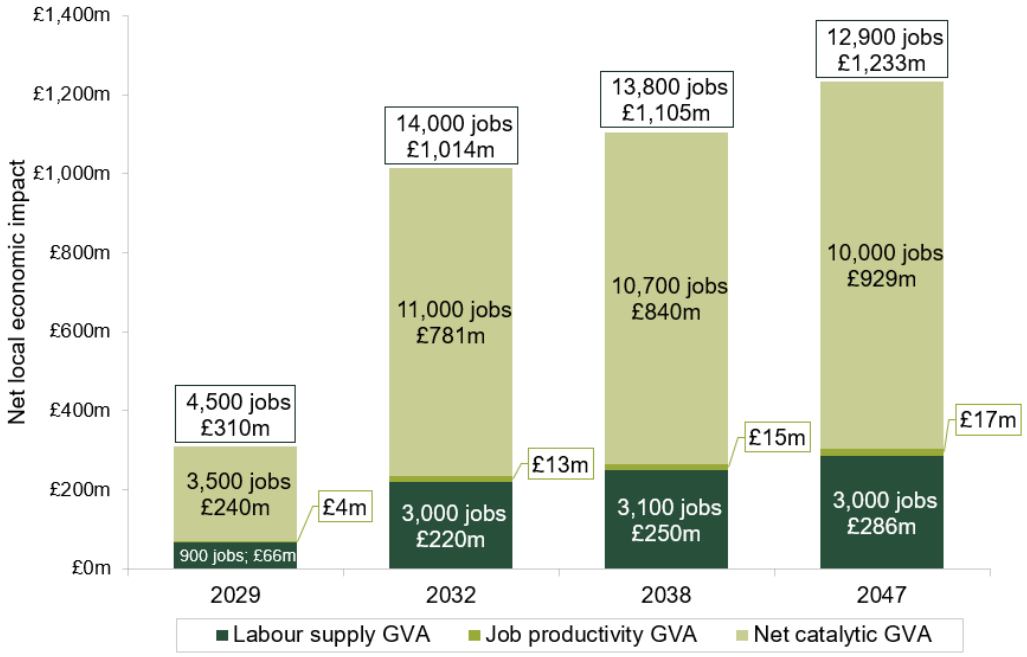
Source: Oxera analysis.

5D.5 Net impacts summary

5.113 In this subsection, we summarise the net economic impacts split across the three impacts (labour supply, productivity, and catalytic) and the geographic distribution of these impacts within the study area.

5.114 First, Figure 5.14 shows the build-up of the incremental net impact split by type of impact. As shown in subsection 5D.3, the job productivity impact represents a smaller share of the overall net impacts (£15m out of a £1.1bn total in 2038), which are split mostly between labour supply impacts (£250m in 2038) and net catalytic impacts (£840m). The impact of the Project increases over time (for example, passenger growth at Gatwick due to the Project goes from 7% in 2029 to 21% in 2038), as does its overall net impact, which increases from £310m in 2029 to £1.1bn in 2038.

Figure 5.14 The Project's net economic impacts as value over the base scenario (GVA)

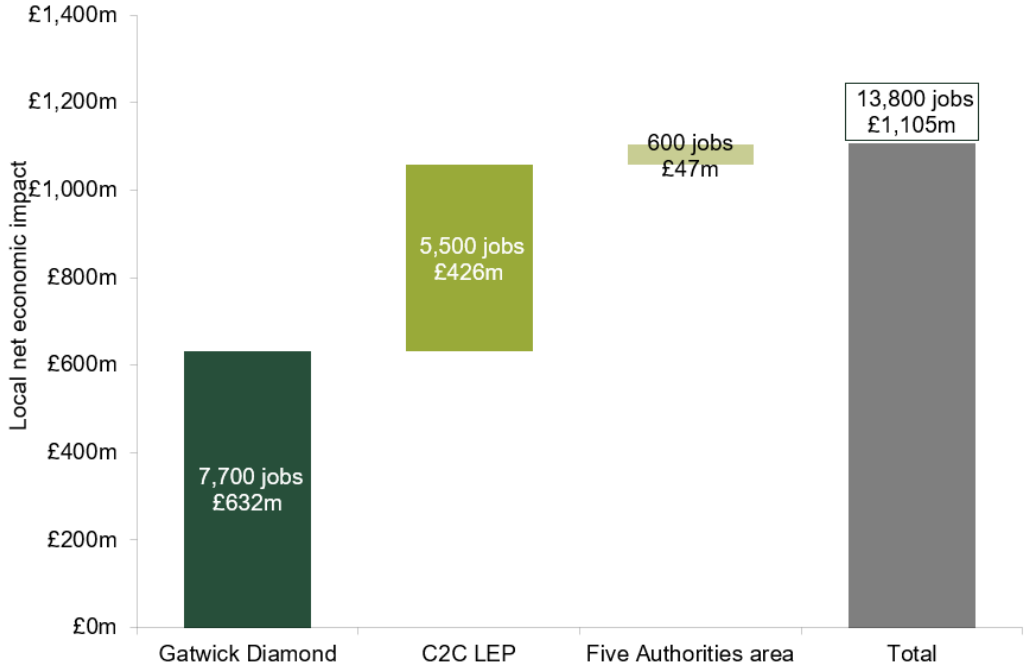


Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates each year, after the reallocation of resources and people is accounted for. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

5.115 Figure 5.15 below shows the geographic breakdown of the overall net impact estimates. The significant share of net impacts (like the footprint) is located between the Gatwick Diamond (£632m in 2038) and the Coast to Capital LEP (£426m). The parts of the Five Authorities area that are not included in either the Gatwick Diamond or the Coast to Capital LEP receive a smaller share of the net impacts (£47m in 2038).

Figure 5.15 Net economic impacts of the Project across the study area



Note: C2C LEP, Coast to Capital LEP. Entries correspond to the difference between the Project estimates and Baseline scenario estimates in 2038. Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: Oxera analysis.

5E Local economic impacts summary

5.116 The Project will have a significant local economic footprint. This will include direct activity on site associated with servicing additional air traffic, indirect activity across the supply chain, and businesses relocating or expanding in the local area due to improved connectivity. We estimate that these effects will initially support 6,800 jobs and £465m of GVA per year (2029 estimates). This will grow as traffic volumes increase, rising to 20,300 jobs and £1.6bn GVA in 2038, and 19,000 jobs and £1.8bn of GVA in 2047.[232] As might be expected, much of the economic footprint is concentrated around the airport, and we estimate that there will be a significant impact more widely across the Gatwick Diamond, the Coast to Capital LEP and, to a lesser extent, the Five Authorities area.

5.117 Some of the economic footprint of the Project will be offset; for instance, some of the jobs created could involve employees switching jobs rather than generating entirely new employment. However, even when taking these effects into account, our analysis suggests that the Project will make a significant net contribution to the local area. We estimate that 4,500 jobs would be created with an annual GVA of £310m through increased productivity, greater output, and increases in labour supply in 2029, rising to 13,800 jobs and £1.1bn GVA in 2038, and 12,900 jobs and £1.2bn of GVA in 2047.[233]

[232] All estimates are reported in 2021 prices. Employment figures are expressed as headcounts.
[233] All estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

6 Conclusions

6.1 We have conducted an Economic Impact Assessment of Gatwick Airport's Northern Runway Project—a proposal to make best use of Gatwick's existing runways and, in particular, making changes to the northern runway, which, together with lifting the current restrictions on its use, would enable dual runway operations.

6A National impacts

6.2 Our analysis finds that the Project would significantly expand capacity at Gatwick and, in turn, enable additional air traffic to flow through Gatwick and the London aviation system as a whole. By alleviating the capacity constraints faced at Gatwick, in particular during peak times, the Project would enable airlines to increase service frequencies and reduce air fares by increasing the number of flights that the airport can accommodate. We estimate the net benefits to passengers, airlines and airports to be between £7.3bn and £14.3bn.[234] In addition, the Project is expected to provide unquantified benefits through:

- increasing competition in the aviation sector;
- increasing the resilience of the airport and the other London airports to unexpected disruptions;
- increasing freight capacity;
- increased tourism.

6.3 By providing increased connectivity, the Project is also expected to have impacts beyond aviation markets. These additional impacts would benefit businesses, provide new job opportunities to individuals, and increase productivity by bringing individuals and businesses together and facilitating increased trade and FDI. We estimate the benefit of these impacts to be £4.7bn–£6.6bn, with a further increase in APD revenues to government of £4.7bn.

6.4 Increased activity at the airport would increase noise levels and GHG emissions, and decrease air quality. Work is underway to understand how these impacts can be reduced, but at this stage the social costs of these environmental impacts are estimated to be between £0.9bn and £3.5bn in 2010 prices and values.

6.5 Taking into account scheme costs of £2.7bn, we estimate that the NPV of the Project will be in the range of £10.5bn to £22.0bn in 2010 prices and values. To put this scale of benefit into context, this means that the Project would have a greater NPV than (for example) London's Crossrail project (£12.3bn).[235]

6B Local impacts

6.6 While there are benefits from the Project to the UK from increased connectivity and capacity, there will also be substantial local and regional impacts. The local area[236] can be characterised as having steady population growth over the last decade, with growth driven mainly by internal and international migration;

[234] 2010 prices and base year. Present value calculated over 60 years from scheme opening in 2029.
[235] See Oxera (2017), 'Investment in rail: the economic benefits', October; and Crossrail (2010), 'Crossrail business case Summary report', July. The estimated NPV of Crossrail is deflated to 2010 prices for comparability.
[236] Specifically, the Gatwick Diamond area and Coast to Capital LEP.

and employment (unemployment) is consistently higher (lower) than in the rest of England. Unemployment across all three study areas (and the Gatwick Diamond in particular) has also been lower. It is also noted that, among those registered as unemployed, there has been a greater concentration of individuals in sales and customer service occupations than in other occupations.

6.7 Average earnings are higher among local residents than among local workers, reflecting commuting patterns into/out of the area. This is particularly true for the Coast to Capital and Five Authorities areas, with their large shares of commuting residents. Overall deprivation across multiple criteria is low within the Five Authorities area compared with the rest of England, although there are pockets of deprivation within the local area including Brighton and Hove, Crawley, Croydon, and the eastern/southern parts of the Five Authorities area, and housing affordability is a challenge in many parts of the local area.

6.8 The Project is expected to have significant direct, indirect and catalytic impacts in the local economy. Relative to the baseline, by 2038 an additional 20,300 jobs and £1.6bn GVA will be created, which will rise to 19,000 jobs and £1.8bn of GVA in 2047. We split these total impacts into direct, indirect, and catalytic impacts in Table 6.1 below.

Table 6.1 Breakdown of economic impact, 2038 and 2047

	GVA (£m)		Employment	
	2038	**2047**	**2038**	**2047**
Direct	284	324	3,200	3,100
Indirect	492	563	6,300	6,000
Catalytic	848	918	10,800	9,900
Total	**1,624**	**1,805**	**20,300**	**19,000**

Note: Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: Oxera analysis.

6.9 Overall, in the Gatwick Diamond, the Project would represent an economic footprint of £889m in GVA and create 10,900 additional jobs in 2038;[237] this would further increase to £986m in GVA and create 10,200 additional jobs in 2047. Detailed results are presented in Table 6.2 below.

Table 6.2 Economic impact in the Gatwick Diamond, 2038 and 2047

	GVA (£m)		Employment	
	2038	**2047**	**2038**	**2047**
Direct	284	324	3,200	3,100
Indirect	118	135	1,500	1,400
Catalytic	487	527	6,200	5,700
Total	**889**	**986**	**10,900**	**10,200**

Note: Estimates are reported in 2021 prices. Employment figures are expressed as headcount.

Source: Oxera analysis.

[237] 2021 prices, for the 2038 calendar year only. Compared with the situation without the Project.

A1 General nature of qualifications, training and experience for occupations in SOC2010 Major Groups

Major Group	General nature of qualifications, training and experience for occupations in the Major Group
Managers, directors and senior officials	A significant amount of knowledge and experience of the production processes and service requirements associated with the efficient functioning of organisations and businesses.
Professional occupations	A degree or equivalent qualification, with some occupations requiring postgraduate qualifications and/or a formal period of experience-related training.
Associate professional occupations	An associated high-level vocational qualification, often involving a substantial period of full-time training or further study. Some additional task-related training is usually provided through a formal period of induction.
Administrative and secretarial occupations	A good standard of general education. Certain occupations will require further additional vocational training to a well-defined standard (e.g. office skills).
Skilled trades occupations	A substantial period of training often provided by means of a work-based training programme.
Caring, leisure and other service occupations	A good standard of general education. Certain occupations will require further additional vocational training, often provided by means of a work-based training programme.
Sales and customer service occupations	A general education and a programme of work-based training related to sales procedures. Some occupations require additional specific technical knowledge but are included in this Major Group because the primary task involves selling.
Process, plant and machine operatives	The knowledge and experience necessary to operate vehicles and other mobile and stationary machinery, to operate and monitor industrial plant and equipment, to assemble products from component parts according to strict rules and procedures and subject assembled parts to routine tests. Most occupations in this Major Group will specify a minimum standard of competence for associated tasks and will have a related period of formal training.
Elementary occupations	Occupations classified at this level will usually require a minimum general level of education (i.e. that which is acquired by the end of the period of compulsory education). Some occupations at this level will also have short periods of work-related training in areas such as health and safety, food hygiene, and customer service requirements.

Source: Office for National Statistics, 'SOC2020 volume 1: structure and descriptions of unit groups', accessed 25 May 2021.

A2 Assumptions and inputs for the analysis

A2.1 Table A2.1 below presents the assumptions used in our national impact models, while Table A2.2 presents the assumptions used in our local impact models.

Table A2.1 Modelling assumptions for national economic impact assessment

Parameter	Value	Comments	Source
Appraisal year	2021	The current year.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Scheme opening	2029	2030 is the first full year of activity with the Project in place.	Gatwick airport
Appraisal end date	2088	60 years after the scheme is opened.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Early discount rate	3.5%	For the first 30 years starting from the appraisal year (2021), and for years earlier than the appraisal year.	HM Treasury (2020), 'The Green Book'
Late discount rate	3.0%	From the 31st year to the end of the appraisal period.	HM Treasury (2020), 'The Green Book'
Price base	2010	Deflated using DfT (2020), 'TAG Data Book, Annual Parameters'.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Discount base	2010	Discounted using the discount rates stated above.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Normal profit	2%	Share of normal operating profits to turnover.	IATA website, 'State of Airline Industry in Europe'
Indirect tax correction	1.19	Applicable for business passengers' consumer surplus and producer surplus calculations to convert factor prices to market prices.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Domestic business/leisure fare ratio	1.9	Business fare divided by leisure fare for domestic travellers.	DfT (2017), Aviation Forecasts
Short-haul business/leisure fare ratio	3.2	Business fare divided by leisure fare for short-haul travellers.	DfT (2017), Aviation Forecasts
Long-haul business/leisure fare ratio	3.9	Business fare divided by leisure fare for long-haul travellers.	DfT (2017), Aviation Forecasts
Interpolations and extrapolations	Varying	Unless otherwise stated, all interpolations are linear and all extrapolations are flatlined.	DfT (2018), 'TAG Unit A1.1 Cost-Benefit Analysis'
Domestic business elasticity	-1.15	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)
Domestic leisure elasticity	-1.10	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)
Short-haul business elasticity	-0.70	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)
Short-haul leisure elasticity	-1.52	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)

Long-haul business elasticity	-0.27	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)
Long-haul leisure elasticity	-1.04	Percentage change in demand as a response to a 1% change in price.	Gillen et al. (2007)
Revenue per passenger—City	£17–£7	Aeronautical–non-aeronautical revenues. In 2017 prices.	City financial statements
Revenue per passenger—Heathrow	£23–£14	Aeronautical–non-aeronautical revenues. In 2019 prices.	Heathrow financial statements
Revenue per passenger—Gatwick	£11–£9	Aeronautical–non-aeronautical revenues. In 2019 prices.	Gatwick financial statements
Revenue per passenger—Luton	£6–£7	Aeronautical–non-aeronautical revenues. In 2019 prices.	Luton financial statements
Revenue per passenger—Southend	£11–£7	Aeronautical–non-aeronautical revenues. In 2017 prices.	Southend financial statements
Revenue per passenger—Stansted	£6–£7	Aeronautical–non-aeronautical revenues. In 2018 prices.	Stansted financial statements
APD—domestic	£26	Standard rate for domestic flights. In 2022 prices.	www.gov.uk Rates for Air Passenger Duty
APD—Short-haul	£26	Standard rate for short-haul flights. In 2022 prices.	www.gov.uk Rates for Air Passenger Duty
APD—Long-haul	£185	Standard rate for long-haul flights. In 2022 prices.	www.gov.uk Rates for Air Passenger Duty
Optimism bias	44%	To reflect uncertainty around the CAPEX costs of the Project.	HM Treasury (2013), 'Supplementary Green Book Guidance Optimism Bias'
OPEX elasticity	0.3	Percentage change in OPEX with respect to a 1% change in passenger numbers.	CAA (2014), 'Economic regulation at Gatwick from April 2014: Notice granting the licence'
OPEX efficiency	1%	An annual efficiency increase expected in the aviation market.	CAA (2014), 'Economic regulation at Gatwick from April 2014: Notice granting the licence'
Tax rate	30%	Average tax rate to calculate benefits from increased productivity with wider impacts arising from the Project.	DfT (2019), 'TAG Unit A2.3 Employment Effects'
Agglomeration elasticity	0.04	Percentage change in productivity with respect to a 1% change in effective employment density. Calculated as the average of elasticities of manufacturing and service sectors.	DfT (2019), 'Wider Impacts Dataset'
Productivity elasticity	0.45	Percentage change in productivity with respect to a 1% change in the share of trade in GDP.	Frankel, J.A. and Romer, D. (1999)

Share of London airports in the UK aviation market	30%	Share of the number of passengers travelling to/from London airports in the total number of passengers travelling to/from the UK.	DfT (2017), 'UK Aviation Forecasts: Moving Britain Ahead'
Trade elasticity	0.0167	Percentage change in the share of trade in GDP with respect to a 1% change in passenger numbers. Calculated as the weighted average of elasticities of imports and exports.	PwC (2013), 'Econometric analysis to develop evidence on the links between aviation and the economy'

Source: Oxera.

Table A2.2 Modelling assumptions for local economic impact assessment

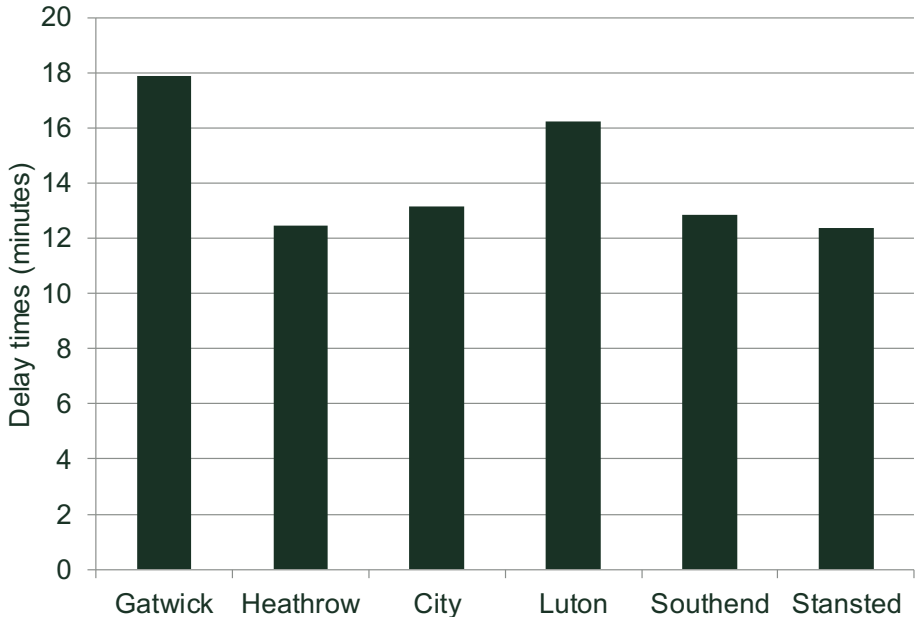
Assumption description	Source
Price base year: 2021	Economic baseline for post-COVID-19 environment
GAL employee numbers increase at the same pace as direct employment	ICF direct employment forecasts
Non-GAL average staff wage	2016 Gatwick Employer and Travel to Work Survey
Ratio of labour compensation to GVA: 66%	ONS Input-Output Tables
Employer National Insurance contribution: 13.80%	UK government
Increase in direct wages: real GDP per household forecasts	TAG Annual parameters
Ratio of staff cost to profitability remains constant	Oxera
Direct to indirect GVA multiplier	ONS Input-Output Tables
GVA per filled job in the South East	ONS
Proportion of indirect GVA in the Diamond: 24% Proportion of indirect GVA in C2C LEP (excl. Diamond): 14%	Oxford Economics 2016 report
GVA distribution by LAD with study area: GVA by LAD	ONS
Employment outcomes absent Gatwick	Oxera literature review
Elasticity of local employment to passenger volumes	Oxera econometric analysis
Low/high skill direct employment categorisation	Oxera literature review

Source: Oxera.

A3 Delay times in the London aviation system

A3.1 In 2019, the total delay in the London aviation system was 269,000 aircraft hours, and the corresponding weighted average delay was 14.2 minutes per aircraft.[238] This is slightly higher than the European average of 13.1 minutes.[239] Figure A3.1 presents the 2019 average delay times at airports in the London aviation system.

Figure A3.1 Average delay times at London airports in 2019



Note: Delay times are averages at each airport weighted by the number of flights on each route.

Source: Civil Aviation Authority (2019), 'Punctuality Statistics: Full and Summary Analysis'.

A3.2 Delays have adverse impacts on passengers, airlines and airports. Passengers face longer or more variable journey times, which may cause frustration and stress.[240] Airlines may have to factor larger buffers into their flight schedules, may have to compensate passengers if the delays are sufficiently long, and incur additional operational costs.[241] Airports may have to invest in additional facilities, such as waiting areas, to accommodate delayed passengers and to avoid becoming crowded and unpleasant environments for air passengers.

A3.3 One reason why these impacts occur is because disruptions reduce the capacity of an airport temporarily and unexpectedly. Airport-related delays are therefore especially likely to occur and have larger impacts when airports are capacity-constrained. For example, at each airport listed in Figure A3.1, delay times might be expected to be lower if the airport had a higher capacity. This is because, in the event of a lack of capacity, there is little flexibility in scheduling to respond to disruptions without causing knock-on delays.[242] As capacity

[238] Oxera analysis of Civil Aviation Authority (2019), 'Punctuality Statistics: Full and Summary Analysis'. Numbers of flights at each airport are used as weights.
[239] Eurocontrol (2020), 'CODA DIGEST 2019: All-Causes Delay and Cancellations to Air Transport in Europe – Annual Report for 2019', p. 1.
[240] Collaborate Research (2016), 'Consumer attitudes to journey disruption – A qualitative research report', November. This report is prepared for the CAA with the reference CAP1472.
[241] Additional airtime of airplanes due to delays also increases the carbon and noise footprint of aviation.
[242] In 2017, 7% of air delays in Europe were airport-related—for example, due to runway closures. For further information see, for example, Eurocontrol (2018), 'Delays – three questions and many answers', August, https://www.eurocontrol.int/news/delays-three-questions-and-many-answers, accessed 7 May 2021.

utilisation of an airport increases, the airport becomes less able to withstand disruptions and recovery from a disruption takes more time.[243]

[243] Civil Aviation Authority (2017), 'Operating Resilience of the UK's aviation infrastructure and the consumer interest', July.

A4 Local and regional economic baseline—comprehensive overview

A4A Introduction

A4.1 In this appendix, we outline the economic conditions and trends in the three local geographies used in our study: the Gatwick Diamond, the Coast to Capital LEP, and the Five Authorities area. This economic 'baseline' provides important background for consideration of the economic impact of the Project. In order to put the economic baseline data into context, we have adopted two benchmarks (the wider South East region, and England as a whole), to provide comparators for the data presented.

A4.2 As 2019 is the last year before the COVID-19 pandemic had a significant impact on the economy and society, we use 2019 as the basis for the assessment. While there are likely to be long-term impacts from COVID-19 and the UK's departure from the EU for the economy and society in these areas (particularly around the geographic distribution of workers and extent/composition of international migration), these impacts are highly uncertain and so are not dealt with in detail in this appendix, which focuses on a factual description of the situation in the study areas and how that compares with relevant benchmarks.

A4.3 To illustrate the impact of the COVID-19 pandemic, we provide a comparison between 2019 and 2020 data for types of employment sought, and update key series to include 2020 data (for example, claimant count information). The purpose of this is not to provide a comprehensive assessment of the impact of the COVID-19 pandemic on the study areas, but to provide some context that the reader may find useful.

A4B Gatwick Diamond

A4.4 Box A4.1 summarises the key characteristics of the Gatwick Diamond that we examine in this section.

Box A4.1 Key characteristics of the Gatwick Diamond

- **Population growth**: the Gatwick Diamond showed relatively high rates of population growth between 2004 and 2009, driven by internal migration (from the rest of the UK) and international migration (from the rest of the world).
- **Employment**: the data shows that the Gatwick Diamond is characterised by high rates of employment and economic activity.
- **Occupational levels**: a higher proportion of residents in the Gatwick Diamond are employed in senior occupations, and wages are materially higher, than the national average.
- Correspondingly, residents also tend to have higher levels of **educational attainment**.
- The **economy** contains a large proportion of small and medium-sized enterprises (SMEs) and businesses in professional/technical fields.
- **Unemployment** rates are relatively low and tend to persist for shorter periods. Sales and retail jobs are especially sought-after, and this trend has grown over time.
- LADs in the Gatwick Diamond also tend to score well in deprivation indices. That said, access to housing appears to be a relative weakness, perhaps driven by affordability.

Source: Oxera.

A4B.1 Population

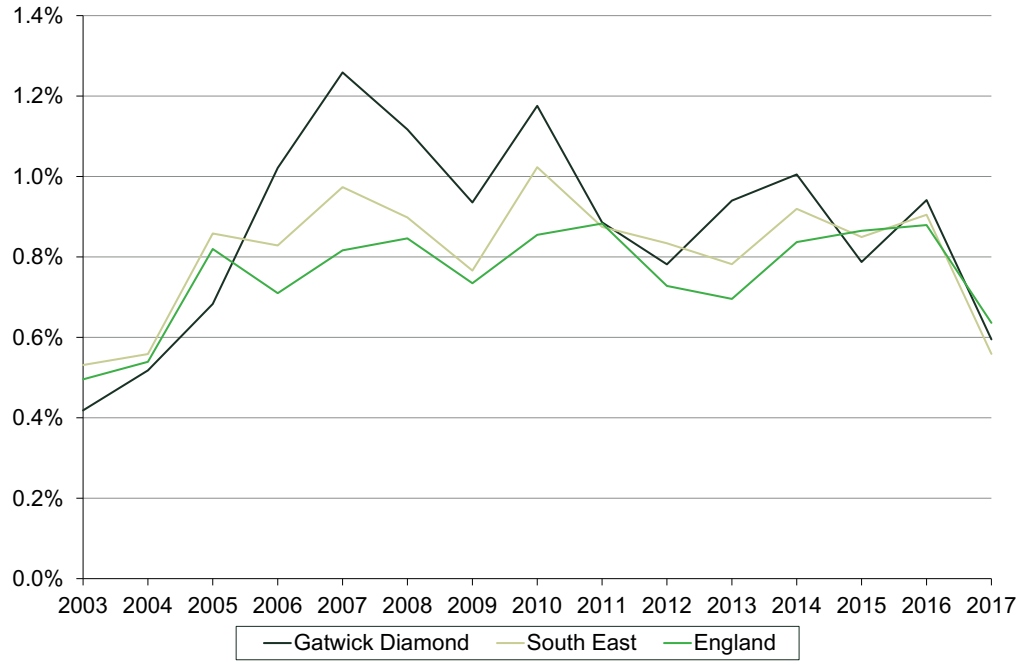
A4.5 This section focuses on the composition of the population in the Gatwick Diamond, and the drivers of change over time. In particular, we consider overall population growth and the distribution of age profiles in the area, both of which have implications for labour supply.

Population growth

A4.6 The population of the Gatwick Diamond was 0.8m in 2017, and has grown by 14% since 2002.[244]

A4.7 Between 2004 and 2010, annual population growth in the Gatwick Diamond exceeded that of both the South East and England. However, in recent years, growth has fallen back in line with the regional and national rates, as shown in Figure A4.1.

Figure A4.1 Year-on-year population growth

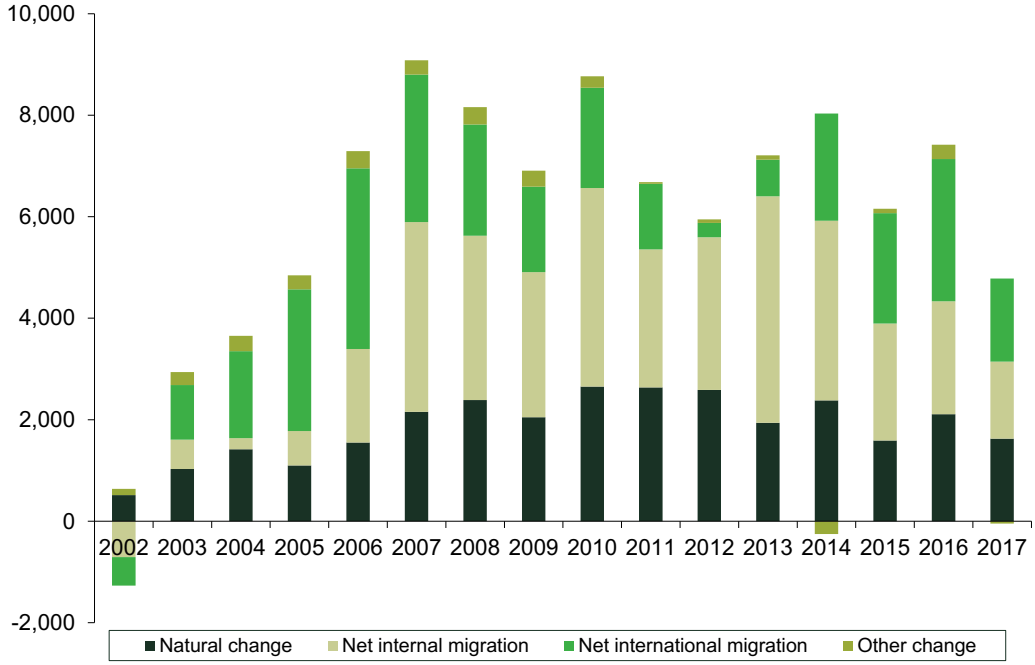


Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.8 These fluctuations in population growth rates in the Gatwick Diamond appear to have been driven by internal and international migration, as shown in Figure A4.2. Internal migration was the largest contributor to population growth in the Gatwick Diamond between 2007 and 2015. International migration was the largest contributor to population growth in the Gatwick Diamond from 2003 to 2006 and from 2016 to 2017.

[244] Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

Figure A4.2 Components of population change, Gatwick Diamond



Note: Natural change is the difference between the number of live births and deaths during each year. Internal migration is defined as residential moves between different LADs in the UK, including those that cross the boundaries between the four UK nations: England, Wales, Scotland, and Northern Ireland. International migration is defined as residential moves to a country other than that of the person's usual residence. Other changes comprise changes to the size of armed forces stationed in the UK and other special population adjustments.

Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.9 According to ONS projections, the population of the Gatwick Diamond will continue to grow, but at a slower rate, with a predicted growth of 14.0% by 2041.[245] This is above the forecast 12.6% population growth in the South East and 11.4% in England. The population growth is forecast to be driven primarily by internal migration.

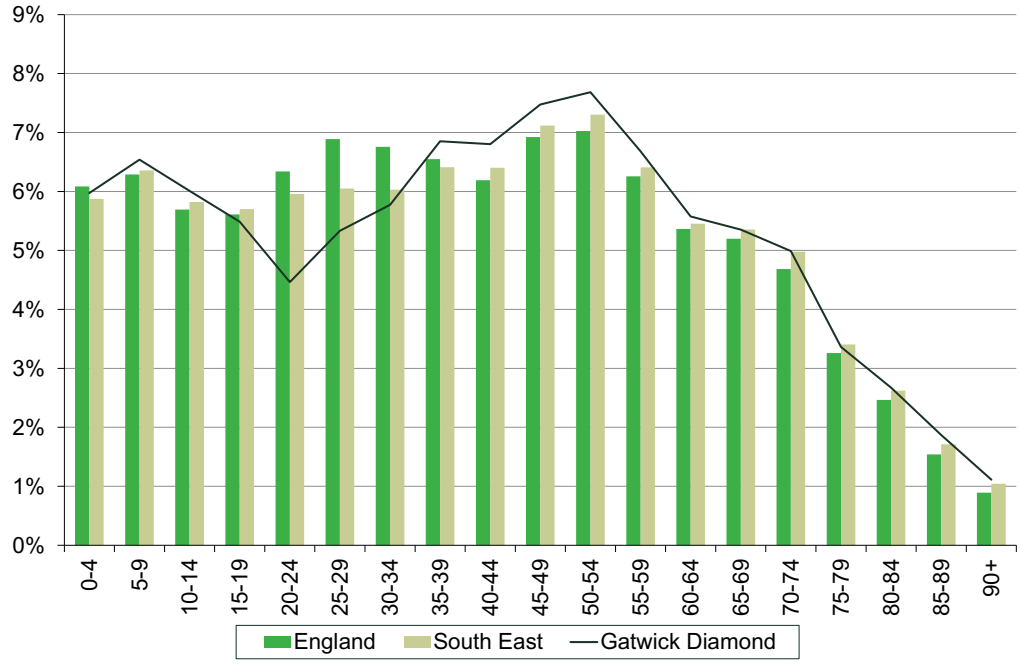
Distribution of ages

A4.10 The working age is defined as people between the ages of 16 and 64 (inclusive).[246] On this basis, the working age population of the Gatwick Diamond is slightly below the national and regional average. 61% of the population is of working age, compared with 61.8% of the South East's population and 62.8% of England's population (see Figure A4.3).

A4.11 This figure is driven by a lower share of people in their early 20s in the Gatwick Diamond than in the South East and England, but offset to an extent by a larger share of people in their late 30s to mid-60s. This is a consistent pattern across all LADs in the Gatwick Diamond.

[245] Office for National Statistics (2019), 'Population projections incorporating births, deaths and migration for regions and local authorities: Table 5', 9 April.
[246] NOMIS (2010), 'Working age', 11 August, https://www.nomisweb.co.uk/articles/487.aspx, accessed 25 April 2019.

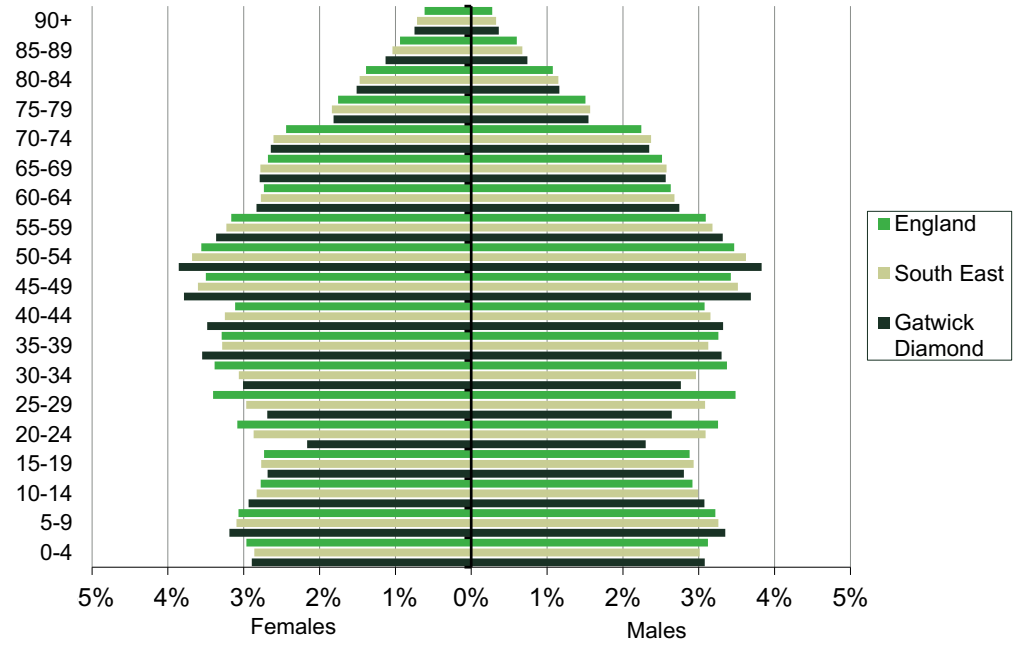
Figure A4.3 Population by age



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.12 Data on population by gender suggests that the difference in age profile between the Gatwick Diamond and both the South East and England is not gender-specific. For instance, in the 20–24 age group, the Gatwick Diamond has a lower share of both males and females.

Figure A4.4 Population pyramid



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

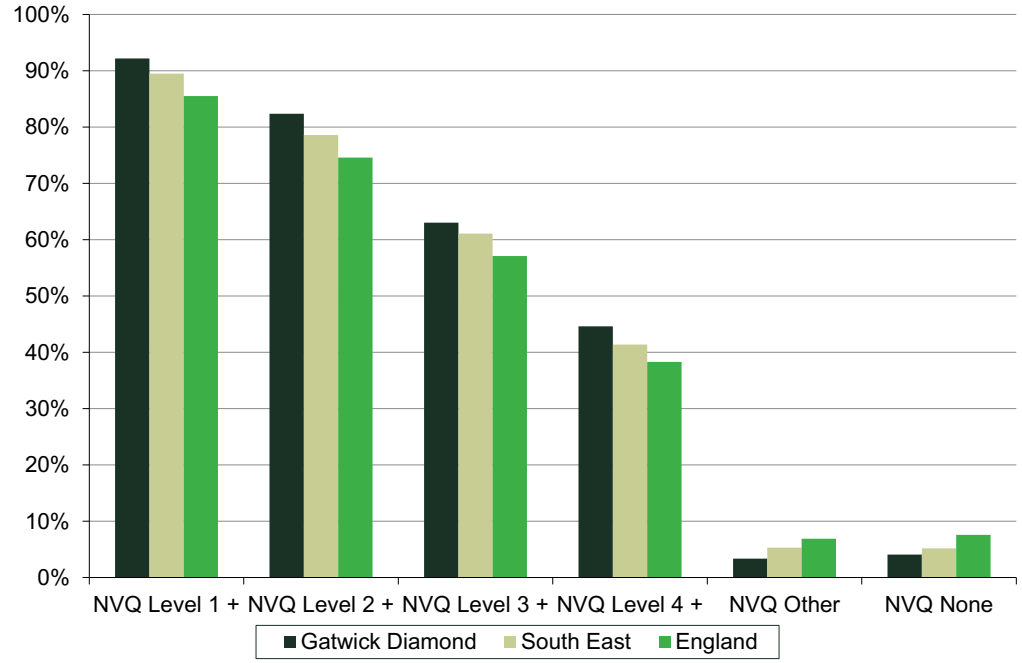
A4B.2 Education

A4.13 Below is an overview of educational attainment and the availability of higher education in the Gatwick Diamond.

Qualifications

A4.14 On average, the population of the Gatwick Diamond is educated to a higher level than the population in the South East or England. As shown in Figure A4.5, over 90% of the working age population in the Gatwick Diamond has at least an NVQ Level 1 qualification, and almost 50% has Level 4 or above.

Figure A4.5 Qualification level of the working age population, as in 2017



Note: NVQ Level 1 is GCSE (grades D–G) or equivalent; NVQ Level 2 is GCSE (grades A*–C) or equivalent; NVQ Level 3 is AS and A Level or equivalent; NVQ Level 4 includes any certificate of higher education.

Source: NOMIS (2019), 'Annual population survey', 22 January.

Further and higher education

A4.15 There are over 50 further education facilities for 16- to 18-year-olds in the Gatwick Diamond. Of these schools and colleges, 22 are performing equal to or above the national average, with the average student achieving a grade C+ or above.[247] However, the Gatwick Diamond has a below-average proportion of the 16–18 population participating in further education in their local community: 41%, compared with 49% in England.[248] This suggests that 16- to 18-year-olds may be travelling outside their local community for further education, possibly indicating that the Gatwick Diamond is undersupplied with further education options.

A4.16 In the Gatwick Diamond and surrounding areas, there are four universities (University of Sussex; University of Brighton; University for the Creative Arts,

[247] UK government, 'Find and compare schools in England', https://www.gov.uk/school-performance-tables, accessed 29 March 2019.
[248] Department for Education (2019), 'Further education and skills dataset', 28 February.

Epsom; and University of Surrey) and three further education colleges delivering higher education courses and apprenticeships.[249] In 2017:

- 95.3% of undergraduate leavers from the University of Sussex were in employment or further study within six months of graduating;[250]
- 92.6% of undergraduate leavers from the University of Brighton were in employment or further study within six months of graduating;[251]
- 96.9% of undergraduate leavers from the University for the Creative Arts were in employment or further study within six months of graduating;[252]
- 94.2% of undergraduate leavers from the University of Surrey were in employment or further study within six months of graduating.[253]

A4.17 Two of these four universities have above the national average graduate employment rate of 94.4%.[254]

A4.18 Young people are likely to move to attend university, or for other higher education opportunities, with 53.5% of 18-year-olds attending university in the UK having a drive time of 70 minutes or more to university.[255] While the University of Sussex, the University of Brighton and the University of Surrey are close to the Gatwick Diamond, there is only one higher education institution actually in the Gatwick Diamond. This could:

- reduce the number of young people who want to stay in the Gatwick Diamond;
- reduce the number of young people who are attracted to the area.

A4.19 These two factors could be contributing to the lower share of the population in their early 20s in the Gatwick Diamond. This is supported by a study conducted by the ONS in 2015, which revealed that the majority of internal migration occurs between the ages of 18 and 30, when people are moving for study and career opportunities.[256]

A4B.3 Labour market

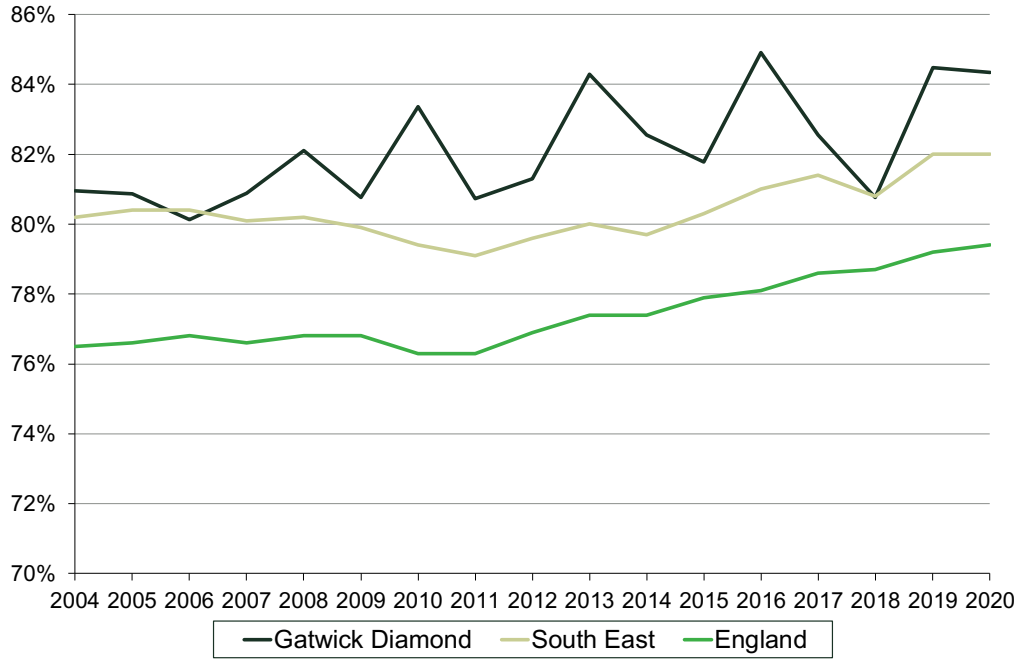
A4.20 This section examines the composition of the labour market, looking at trends in employment and unemployment over time and within sectors.

Economic activity

A4.21 Economic activity in the Gatwick Diamond is higher than in the South East and England, with 84% of the working age population economically active in 2019. This has been on a slight upward trend since 2004, although the trend exhibits a significant amount of fluctuation, which is not seen in the wider geographic areas (see Figure A4.6).

[249] Further education is education below degree level for people above school age. Higher education is education at universities or similar educational establishments, especially to degree level.
[250] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[251] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[252] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[253] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[254] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[255] UCAS (2018), 'Admissions patterns for mature applicants', June.
[256] Office for National Statistics (2016), 'Internal migration, England and Wales: Year Ending June 2015', 23 June.

Figure A4.6 Economic activity over time



Note: Data available from 2004 only. Data for 2020 refers to the economically active population between October 2019 and September 2020, which is the latest period for which data is available. The share of economically active population is weighted by the active population in each of the LADs in the study areas.

Source: NOMIS (2021), 'Annual population survey', January.

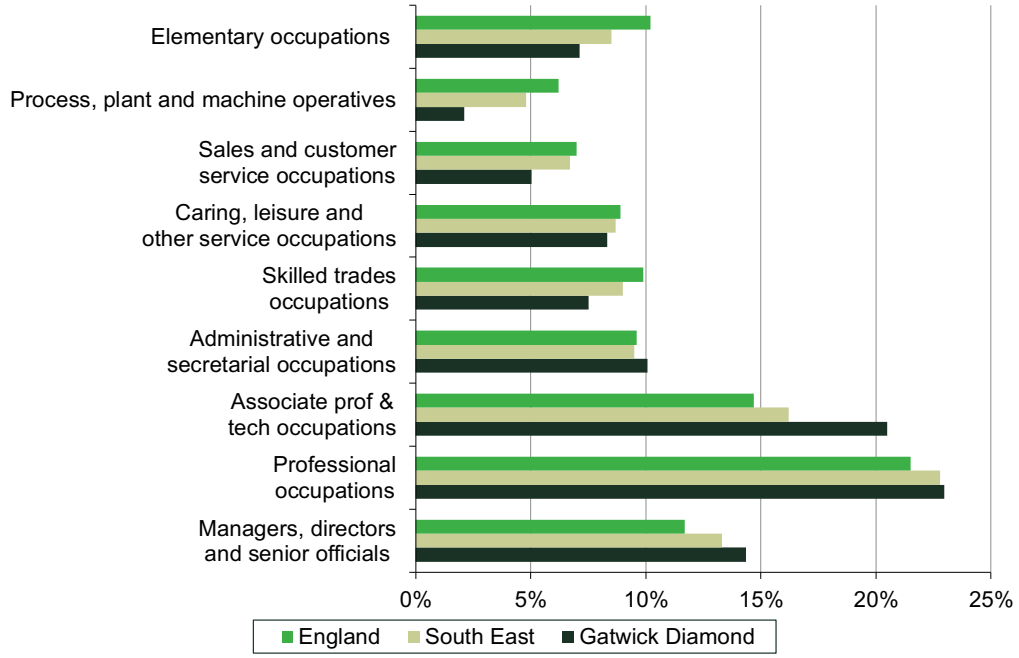
Employment

A4.22 We use ONS data to examine employment patterns in more detail. Again, we use the South East and England as benchmarks for comparison. The data suggests that residents in the Gatwick Diamond are predominantly employed in professional occupations, associate/technical occupations and managerial functions, with 58% of residents employed in these three occupational groups.

A4.23 The share of employment in these occupations is also slightly greater than in the South East and materially greater than in England, as shown in Figure A4.7 below.

A4.24 ONS data suggests that managerial and administrative occupations—two occupation groups for which the Gatwick Diamond has particularly high concentrations of employment—have a relatively high age profile of employees, with high proportions above the age of 45. This is consistent with the age profile of the population in the Gatwick Diamond as well as the higher level of education and training that we might expect to see in these occupations.

Figure A4.7 Employment by occupation in 2019



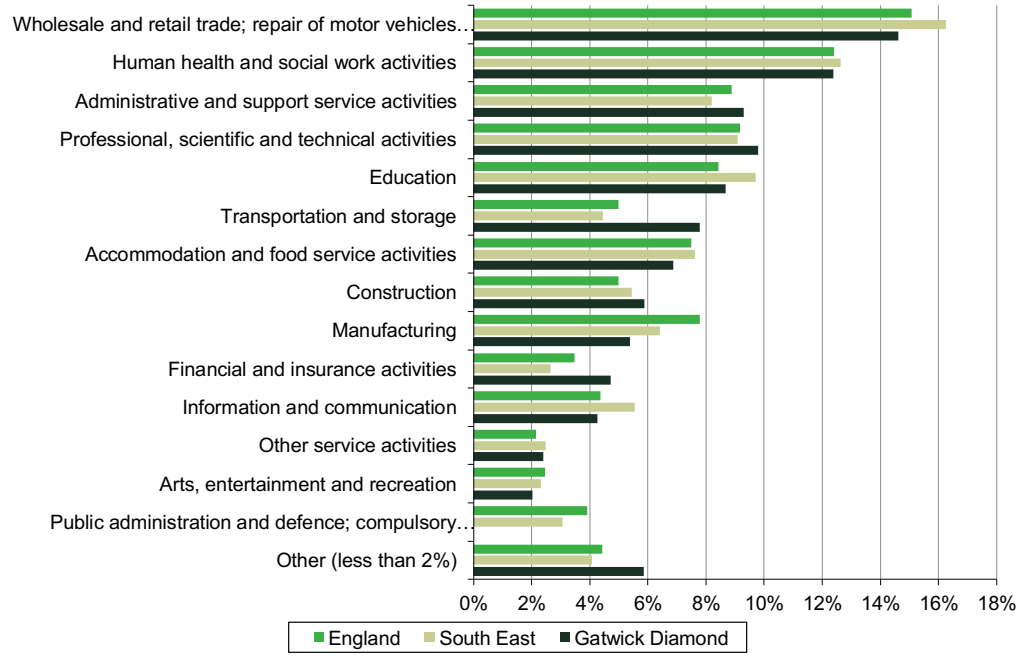
Note: Estimates of population in employment in each LAD are used as weights in each occupation and study area.

Source: NOMIS (2021), 'Annual population survey', January.

A4.25 The data also shows that employment in the Gatwick Diamond is predominantly in desk-based service industries (see Figure A4.8 below). The share of employment in administrative and support service activities, transportation and storage, and finance and insurance industries is larger in the Gatwick Diamond than in the South East or England. Conversely, the Gatwick Diamond has a lower share of employment in the manufacturing, hospitality and education industries.

A4.26 The large share of employment in the transportation and storage industry in the Gatwick Diamond is likely to be driven by the presence of Gatwick Airport, which employed over 20,000 members of staff. This is supported by the fact that the majority, 76.4%, of the Gatwick Diamond's employment in the transportation and storage industry is in Crawley, suggesting that Gatwick Airport and businesses related to Gatwick Airport are driving the large share of employment in the industry.

Figure A4.8 Employment by industry



Note: Employment for calendar year 2019.

Source: NOMIS (2021), 'Business Register and Employment Survey: open access'.

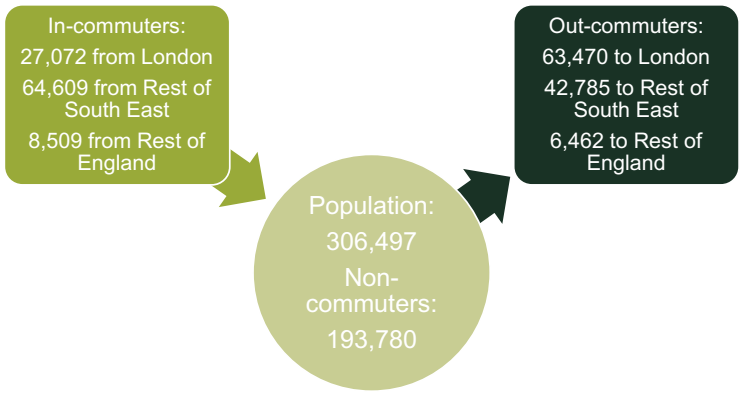
Commuting patterns

A4.27 Data on commuting patterns is available only from the 2011 Census of Population; therefore, in this section we use the most recent data available.[257]

A4.28 In 2011, there was a net commuter flow out of the Gatwick Diamond. The majority of the Gatwick Diamond population, 63.2%, were working in the Gatwick Diamond, but out-commuters exceeded in-commuters by over 12,000 people.[258] As shown in Figure A4.9, out-commuters were primarily commuting to London, while in-commuters were predominantly commuting from elsewhere in the South East.

[257] This is consistent with other recent DCO applications.
[258] This only considers the population of working age residents in the Gatwick Diamond who were in employment at the time of surveying.

Figure A4.9 Commuting patterns, 2011



Note: The population includes only working age residents who were in employment at the time of surveying.

Source: Office for National Statistics (2011), 'Census of population, 2011'.

A4.29 The Gatwick Diamond Initiative has identified a need to ensure that there is 'an adequate supply of workers with the skills required to sustain economic growth', as there is currently a disproportionately high proportion of residents commuting to London.[259]

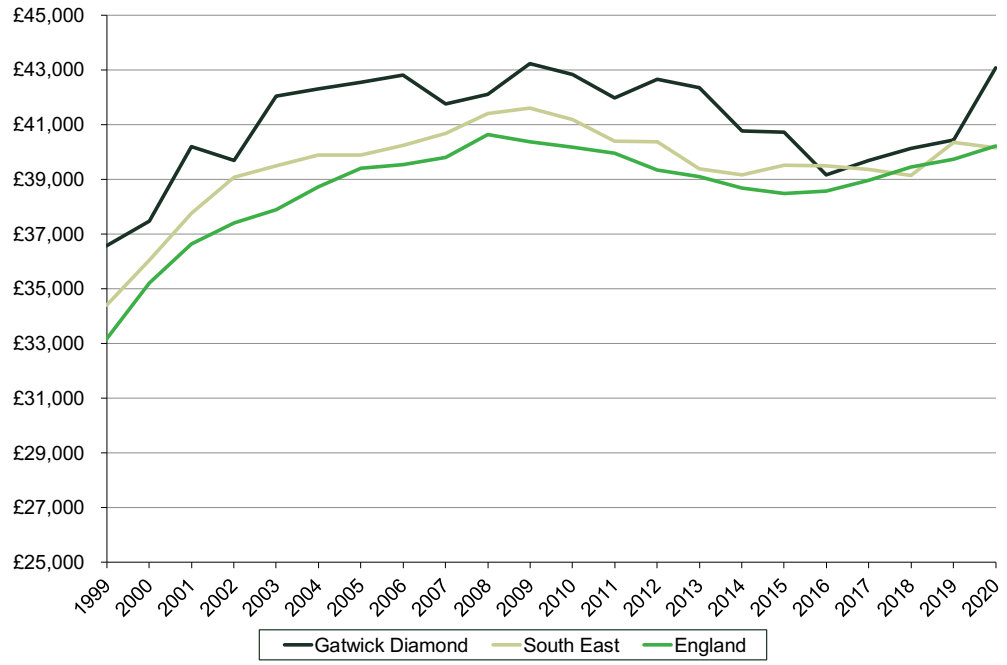
Earnings

A4.30 Residents of the Gatwick Diamond tend to have above-average earnings, unlike residents in the wider South East of England and England as a whole. The same is true for employees working in the Gatwick Diamond, albeit to a lesser extent.

A4.31 Historically, the Gatwick Diamond has maintained an earnings wedge above the South East and England in workplace-based earnings; however, this has reduced in recent years, with earnings falling to being in line with the South East (see Figure A4.10 below). In 2019, workplace-based earnings in the Gatwick Diamond were approximately £700 above the national average.

[259] The Gatwick Diamond Initiative (2018), 'Business Plan 2018-2021', January, p. 2.

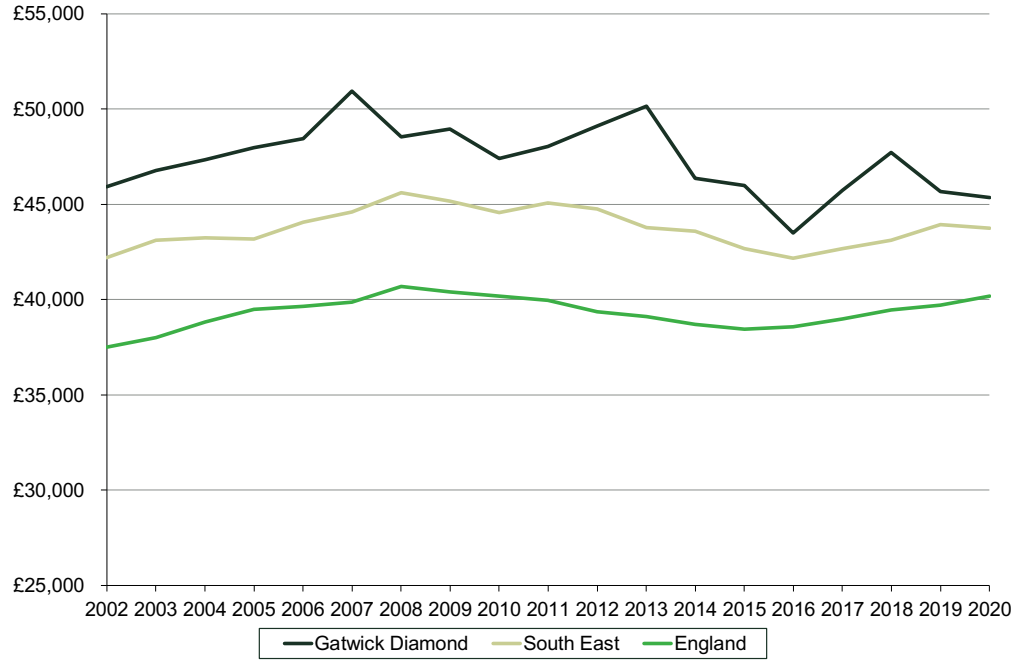
Figure A4.10 Mean annual full-time earnings (real 2021), workplace-based



Source: NOMIS (2021), 'Annual survey of hours and earnings – workplace analysis'.

A4.32 Residence-based earnings have also been consistently higher in the Gatwick Diamond, and the earnings wedge has been maintained in recent years, unlike with workplace-based earnings. In 2019, as shown in Figure A4.11, residence-based earnings were approximately £6,000 above the national average.

Figure A4.11 Mean annual full-time earnings (real 2021), residence-based



Source: NOMIS (2021), 'Annual survey of hours and earnings – resident analysis'.

A4.33 Trends in earnings among employees and residents of the Gatwick Diamond could be explained by some of the characteristics of the working age population as well as the structure of the local economy.

Location of employment

A4.34 There is significant out-commuting from the Gatwick Diamond to London, which could explain the significantly higher resident earnings, as people may be travelling further for higher wages.

Education level

A4.35 It is also the case that educational attainment is positively correlated with income. Therefore, the higher-than-average education level in the Gatwick Diamond is also likely to be contributing to higher earnings.

Age of employees

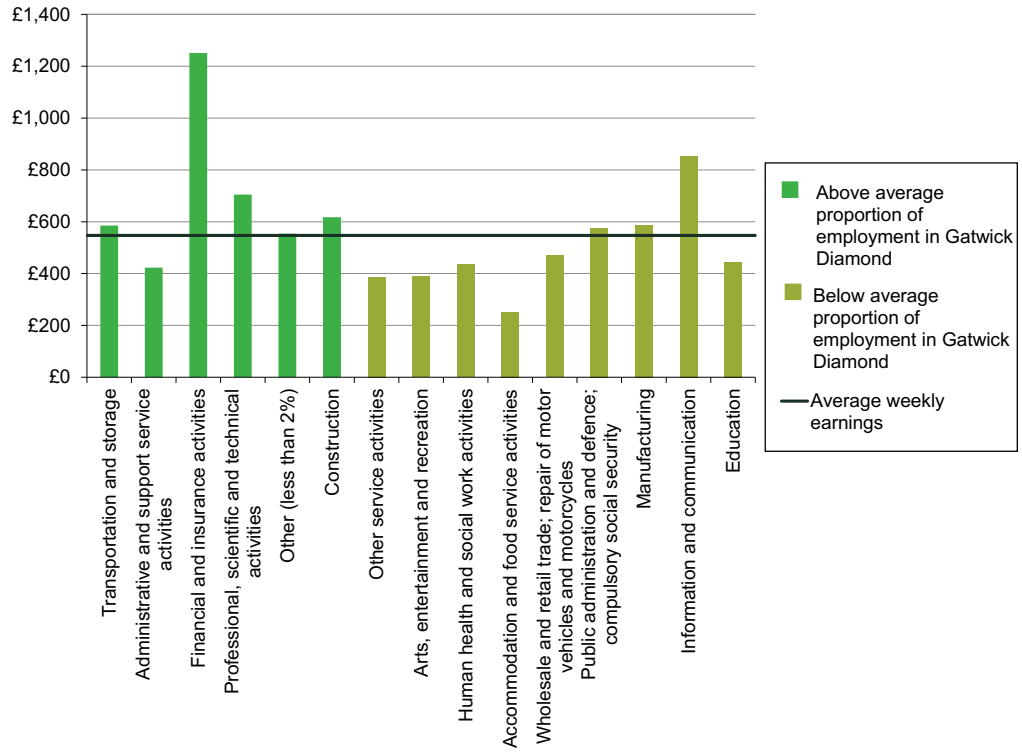
A4.36 ONS analysis suggests that average hourly wages are positively correlated with age until the age of 50. On average, wages peak between the ages of 35 and 50.[260] This could explain, to some extent, the earnings gap between the Gatwick Diamond and the regional and national comparators, as there is a larger-than-average proportion of the population between the ages of 35 and 50 in the Gatwick Diamond.

Industrial mix of workplace employment

A4.37 The industries within the Gatwick Diamond that have a higher-than-average proportion of employment also tend to have higher-than-average wages. For example, average weekly earnings in the financial services and insurance activities industry are more than double the average earning level across all industries. The construction and professional, scientific and technical activities industries have above-average weekly earnings, as shown in Figure A4.12. The high earnings of the prominent industries in the Gatwick Diamond are reflected in average annual wages, both part-time and full-time, which are higher in the Gatwick Diamond than in the South East or England.

[260] Office for National Statistics (2018), 'Public and private sector earnings in the UK: 2017', 2 November.

Figure A4.12 Average weekly earnings by industry



Note: Price base year is 2018. Average weekly earnings are calculated as the average earnings in each industry weighted by the proportion of total employment in the Gatwick Diamond.

Source: Office for National Statistics (2019), 'Average weekly earnings by industry (Monthly Wages and Salaries Survey)', 19 March.

Unemployment

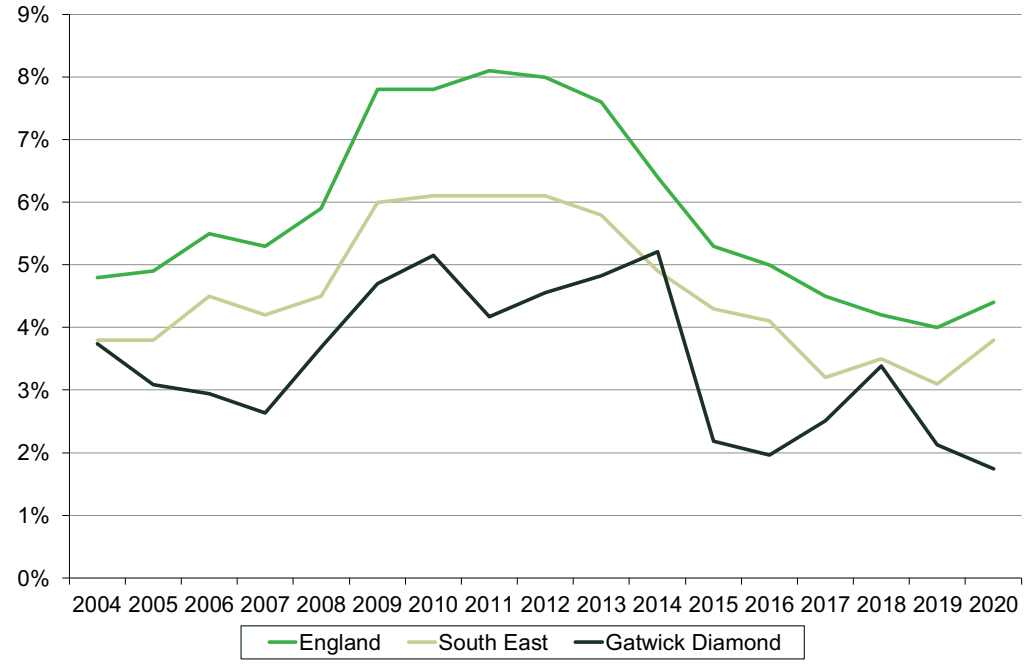
A4.38 There are two ways to measure unemployment: using the claimant count (total number of people eligible to claim Jobseeker's Allowance) and using the Labour Force Survey (total number of people without any kind of job, who have looked for work in the last month and are available to start work immediately).

A4.39 Labour Force Survey (LFS) data is not available at the local authority level, so we have used Annual Population Survey (APS) data, which combines data from two waves of the LFS with the continuous household survey data collected in the APS.

A4.40 Unemployment is consistently lower in the Gatwick Diamond than in England. The unemployment rate rose above 5% in 2014 but has since fallen to approximately 2% in 2019 and 1.8% in 2020. On average, it is 3 percentage points lower than in England. Figure A4.13 shows how unemployment has changed over time. The trends have been similar in the Gatwick Diamond to those in both the South East and England, displaying the same increase following the 2008 recession.

A4.41 The large fall in unemployment in the Gatwick Diamond in 2015 could be in part due to withdrawals from the labour market as economic activity declined by almost 1 percentage point. There was also an increase in the employment rate of more than 1.5 percentage points between 2014 and 2015. This might also have helped to close the earnings gap between the Gatwick Diamond and the regional and national comparators, because an increase in employment increases the demand for labour, thus reducing wages.

Figure A4.13 Unemployment over time

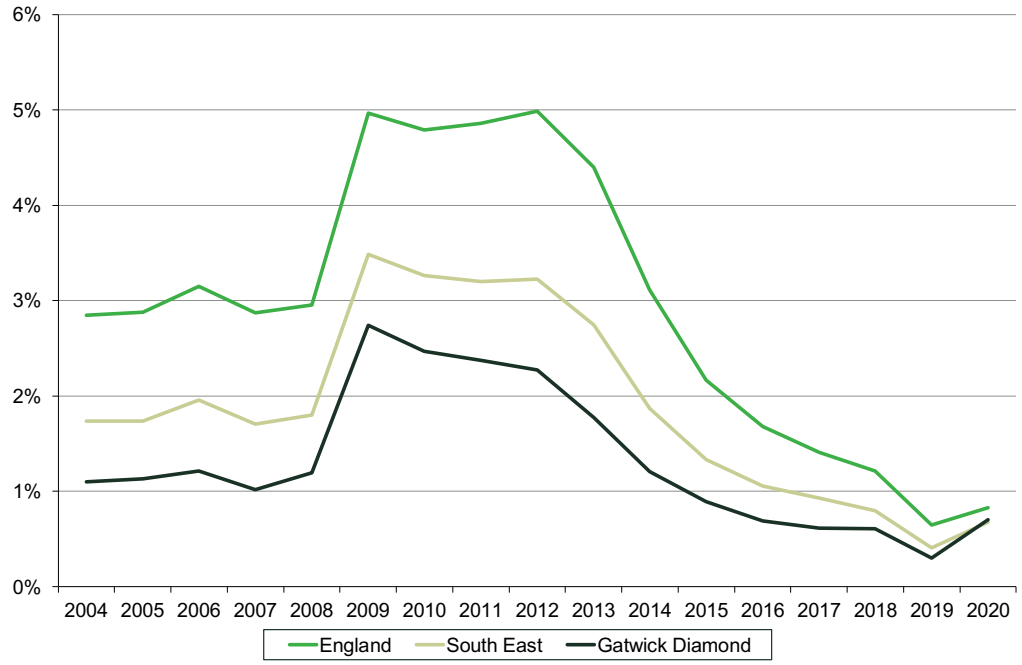


Note: Unemployment rate calculated as a proportion of the economically active population who are unemployed from January to December, with the exception of 2020, where data from October 2019 to September 2020 was used.

Source: NOMIS (2021), 'Annual population survey', January.

A4.42 The proportion of the economically active population claiming Jobseeker's Allowance has historically been lower than the proportions in both the South East and England, as shown in Figure A4.14. The proportion of people claiming Jobseeker's Allowance has moved with a similar trend to unemployment over the period.

Figure A4.14 Claimant count



Note: Claimant count calculated as the average proportion of the economically active population claiming Jobseeker's Allowance between January and December, with the exception of 2020, where data from October 2019 to September 2020 was used.

Source: NOMIS (2021), 'Jobseeker's Allowance with rates and proportions', March.

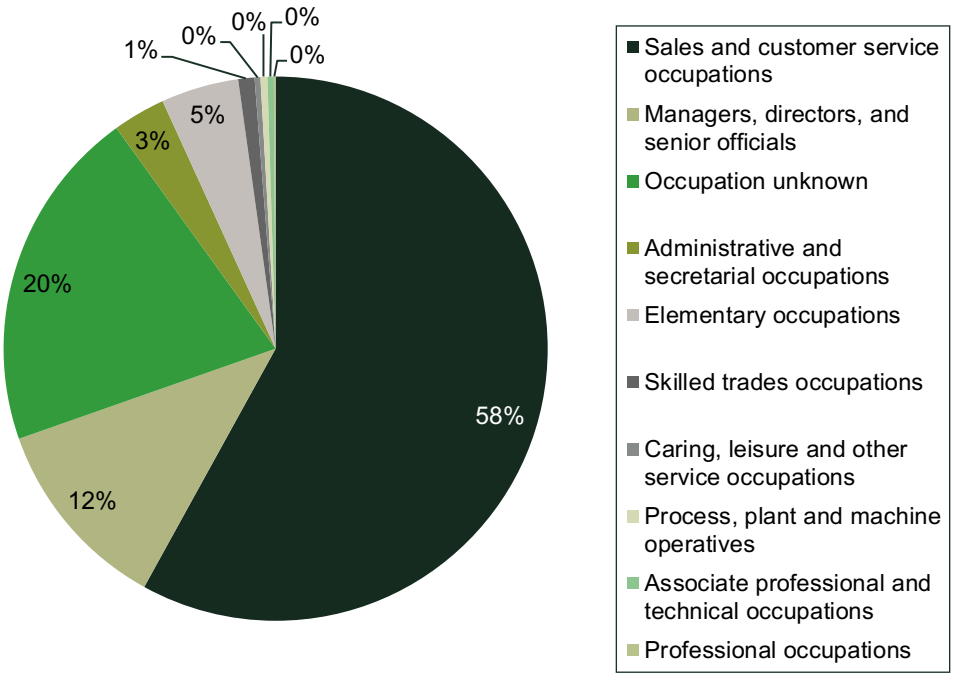
A4.43 The data suggests that periods of unemployment in the Gatwick Diamond are also relatively short. On average, the claim period in the Gatwick Diamond is shorter than that in the South East or England, with 8.3% claiming for less than one month in the Gatwick Diamond, compared with 5.4% in England, and 63.7% claiming for longer than six months, compared with 79.6% in England.[261]

A4.44 As shown in Figure A4.15, sales and customer service occupations (such as retail and telephone sales) are the most highly sought-after occupations in the Gatwick Diamond, with 58% of claimants seeking these occupations. Sales occupations comprise just 7% of employment in the Gatwick Diamond, and a similarly low proportion in the South East and England. This indicates an excess supply, and, consequently, high levels of unemployment for sales occupations in the Gatwick Diamond but also throughout the country. It may also indicate a higher churn rate in sales and customer service occupations than in other occupations.

A4.45 Conversely, professional occupations make up the largest proportion of employment but the smallest proportion of unemployment, indicating low rates of unemployment in professional occupations. Managerial and administrative occupations also comprise a significant proportion of employment in the Gatwick Diamond, and a lesser proportion of unemployment in the Gatwick Diamond. These trends are consistent with the South East and England, suggesting that this is a sector-wide pattern.

[261] NOMIS (2021), 'Jobseeker's Allowance by age and duration', March.

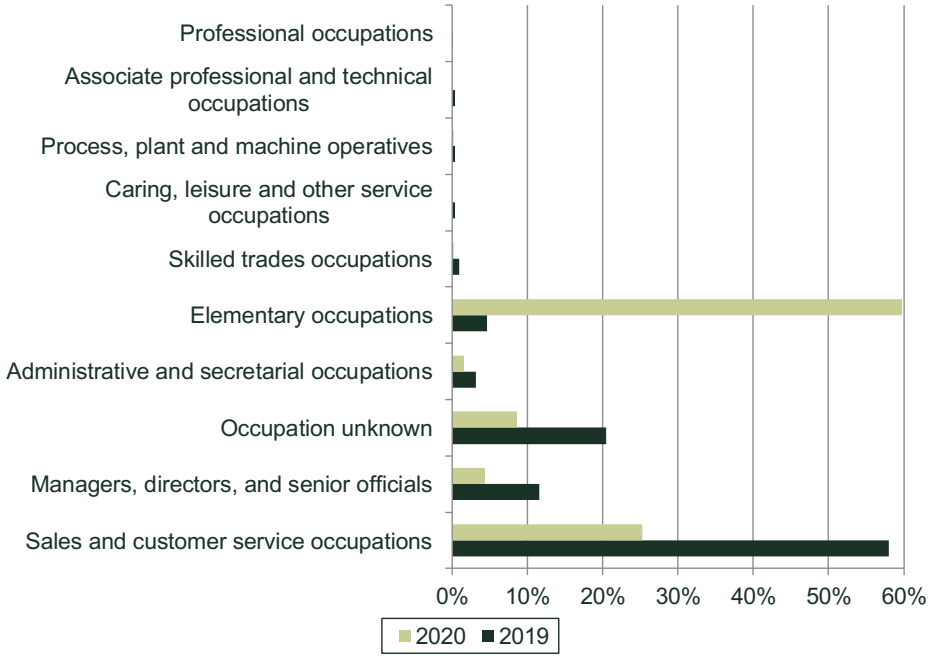
Figure A4.15 Jobseeker's Allowance by occupation sought in the Gatwick Diamond in 2019



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.46 Figure A4.16 below shows the difference between 2019 and 2020 data in Jobseeker's Allowance by occupation sought. As can be seen in the chart, a shift happened in the most sought-after occupations from 'sales and customer service occupations' to 'elementary occupations'. This shift translates the effect of pandemic-induced restrictions on the ability of certain sections of employment to work. While 'sales and customer service occupations' were able to continue working remotely, a number of people in 'elementary occupations' might not have been able to do so, and were unlikely to have been directly affected by the furlough scheme because of temporary work contracts (for example, in the food sector).

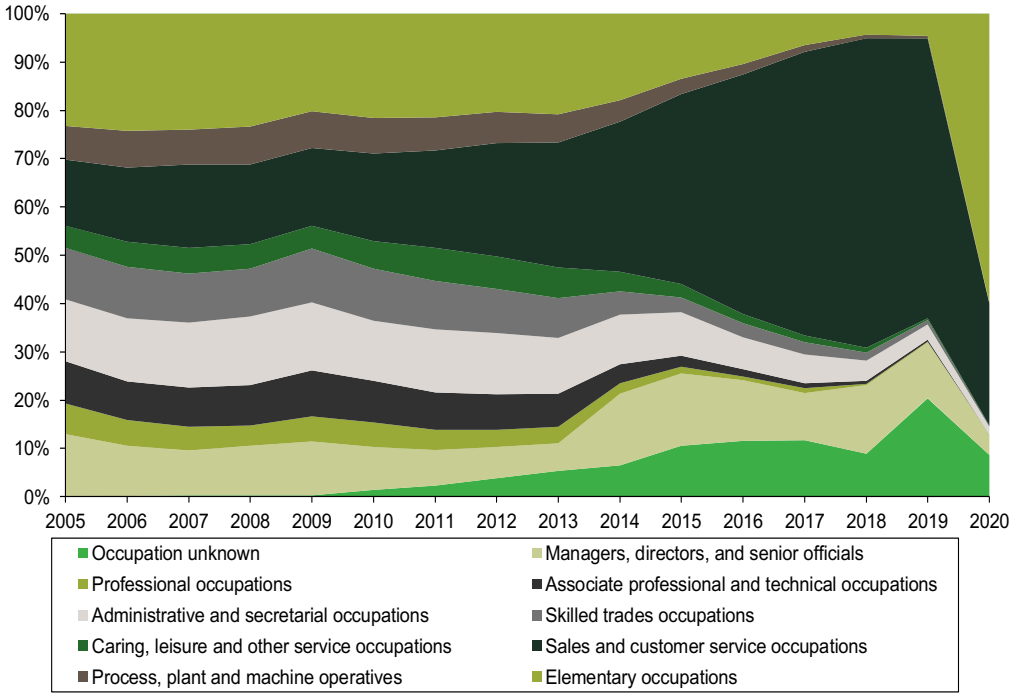
Figure A4.16 Jobseeker's Allowance by occupation sought in the Gatwick Diamond, as in 2019 and 2020



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.47 Historically, elementary occupations were the most highly sought-after occupations; however, since 2012, the proportion of claimants seeking sales occupations has risen rapidly. Figure A4.17 shows the change in occupations sought by claimants over time.

Figure A4.17 Jobseeker's Allowance by occupation sought, Gatwick Diamond



Source: NOMIS (2021), 'Jobseeker's Allowance by occupation, age and duration'.

A4B.4 Economy

A4.48 This section examines the composition of the business population in the Gatwick Diamond relative to the regional and national comparators.

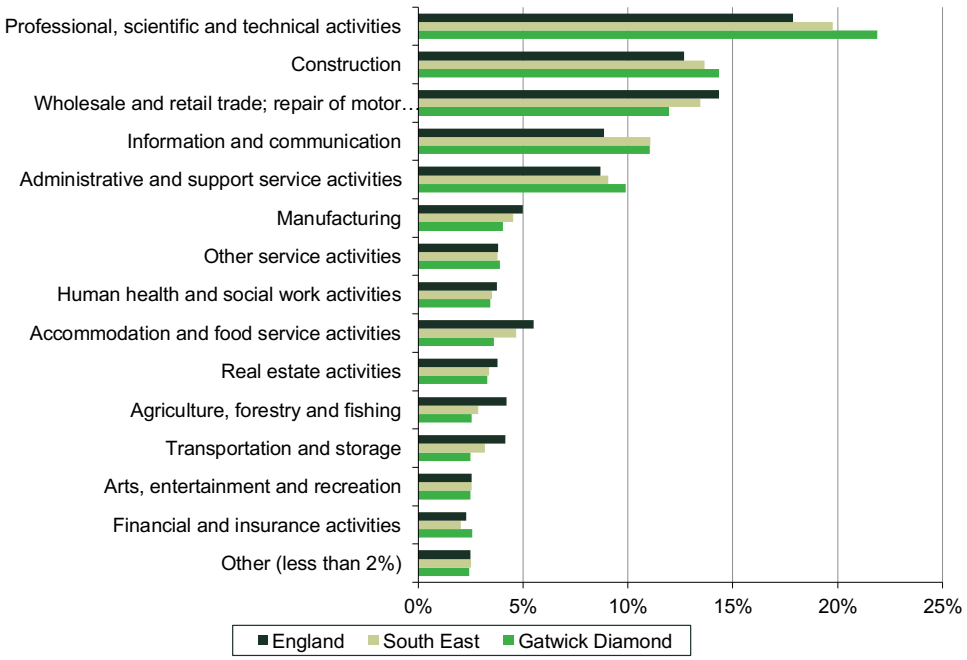
Enterprise

A4.49 The Gatwick Diamond Initiative has identified three key sectors in which it plans to focus its growth strategies: Digital Technologies, Medical Technologies, and Professional Business Services.[262]

A4.50 This focus is consistent with the existing composition of the economy. The industry group encompassing these sectors—professional, scientific and technical activities—is the most prominent industry group in the Gatwick Diamond. Furthermore, the share of businesses in these sectors is around 4 percentage points higher than in England as a whole.

A4.51 The industries in which the Gatwick Diamond has a higher proportion of enterprises than the South East and England are generally consistent with the industries in which employment is relatively higher. However, the Gatwick Diamond has a much larger proportion of employment in the transportation and storage industry than either the South East or England, but has a lower proportion of enterprises in that industry. This suggests that there is a prevalence of larger transport businesses in the Gatwick Diamond, consistent with the location of Gatwick Airport.

Figure A4.18 Enterprises by industry, as in 2019



Note: This is representative of the number of businesses in each industry and is not indicative of revenues in each industry.

Source: NOMIS (2021), 'UK Business Counts', March.

A4.52 The prevalence of the professional, scientific and technical activities industry has been increasing over time in the Gatwick Diamond, in line with national and regional trends. However, this has consistently been the largest industry

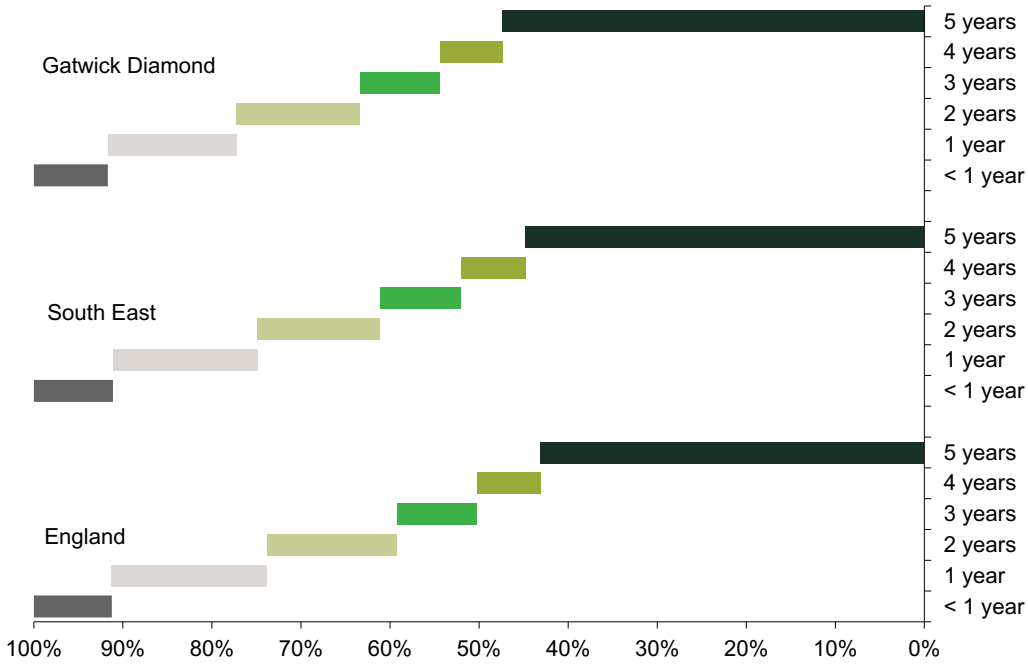
[262] The Gatwick Diamond Initiative (2018), 'Business Plan 2018-2021', January, p. 4.

by number of businesses in the Gatwick Diamond, whereas it only became the largest industry nationally in 2013. Prior to this, wholesale and retail trade was the largest industry, and is still the largest employer in the Gatwick Diamond and the regional and national comparators.

A4.53 There are approximately 39,900 enterprises in the Gatwick Diamond in 2019.[263] This has been increasing steadily over time, in line with the South East and England. Compared with the regional and national comparators, a larger proportion of enterprises in the Gatwick Diamond are SMEs, and fall into the £100,000–£499,000 turnover band. Correspondingly, a below-average proportion of enterprises fall into the turnover bands of £500,000 and above.

A4.54 Businesses in the Gatwick Diamond also have a slightly higher survival rate than the regional or national average. Figure A4.19 shows the survival rate of new businesses launched in 2012. The data shows that a slightly larger proportion of new businesses survived their first five years in the Gatwick Diamond (47.4%) than in the South East (44.8%) or England (43.1%).

Figure A4.19 Business survival rate (launched in 2012)



Source: Office for National Statistics (2018), 'Business demography, UK', 21 November.

Deprivation

A4.55 This section examines the level of deprivation in the Gatwick Diamond relative to the regional and national comparators.

Deprivation indices

A4.56 The Index of Multiple Deprivation (IMD) provides a set of relative measures of deprivation by area. It is calculated using seven domains of deprivation (Income Deprivation; Employment Deprivation; Education, Skills and Training Deprivation; Health Deprivation and Disability; Crime; Barriers to Housing and Services; Living Environment Deprivation). There are two supplementary indices (the Income Deprivation Affecting Children Index, and the Income

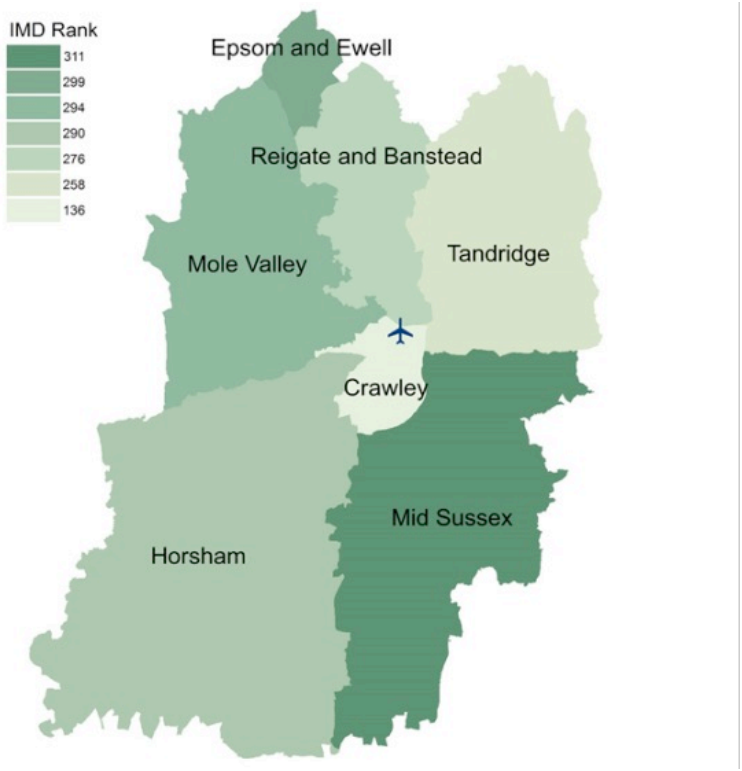
[263] NOMIS (2018), 'UK Business Counts', 10 March.

Deprivation Affecting Older People Index) in addition to the IMD and the seven domains.

A4.57 Overall, the seven LADs in the Gatwick Diamond perform well in most deprivation indices, with six of the LADs in the upper quartile (least deprived 25% of LADs) for six of the nine domains and sub-domains; these six LADs are also in the top 20% for the overall IMD. Table A4.1 below shows the percentile in which each LAD falls for each of the domains and sub-domains.

A4.58 Six out of the seven LADs perform worse in Barriers to Housing and Services than in other domains. This is driven largely by the proximity of local services, for which LADs such as Crawley or Horsham are particularly deprived areas. However, it is also likely to be driven in part by the affordability of housing. House prices in the Gatwick Diamond are high relative to earnings. Based on the median affordability ratio, workers in the Gatwick Diamond could expect to pay between 9 and 16 times their annual gross full-time earnings, compared with 8 times earnings in England as a whole and 10 times in the South East.[264] The affordability ratio for the lower quartile of earnings and house prices is also higher in the Gatwick Diamond than in the South East or England. All seven LADs have a higher affordability ratio than the South East average.

Figure A4.20 Index of Multiple Deprivation



Note: The IMD rank is the average rank within the LAD. There are 317 LADs in England; 1 is the most deprived and 317 is the least deprived. The lowest rank on the map is for Crawley (136), and the highest rank is for Mid Sussex (311).

Source: Ministry of Housing, Communities & Local Government (2019), 'English Indices of Deprivation 2019', 26 September.

[264] Office for National Statistics (2021), 'House price to workplace-based earnings ratio', 25 March.

Table A4.1 Indices of deprivation

	Epsom and Ewell	Mole Valley	Reigate and Banstead	Tandridge	Crawley	Horsham	Mid Sussex
Income deprivation	96	98	86	87	42	95	98
Employment deprivation	96	91	88	85	55	91	97
Education, skills and training deprivation	95	94	83	77	16	89	88
Health deprivation and disability	95	87	79	79	45	88	97
Crime	45	75	58	32	37	87	85
Barriers to housing and services	51	39	38	37	12	24	59
Living environment deprivation	71	59	55	53	65	68	88
Income deprivation affecting children	93	98	85	84	38	96	97
Income deprivation affecting older people	95	98	90	94	36	97	96
IMD	**94**	**93**	**87**	**81**	**43**	**91**	**98**

Note: All numbers represent the percentile in which the LAD rank falls for each index, with 1% being the most deprived LADs. The LAD rank is calculated as an average of the LSOA ranks within the LAD.

Source: Ministry of Housing, Communities & Local Government (2019), 'English Indices of Deprivation 2019', 26 September.

Contextualisation of observed high barriers to housing and services in the Gatwick Diamond

A4.59 Table A4.1 shows that the LADs in the Gatwick Diamond have relatively high scores on the Barriers to Housing and Services Deprivation index. This poor performance can be explained by the combination of that index's construction and the special conditions of the housing market in the South East of England, within which the Gatwick Diamond lies.

A4.60 The Barriers to Housing and Services Index measures the physical and financial accessibility of housing and local services via two 'sub-domains': geographical barriers and wider barriers.[265] The 'geographical barriers' subdomain relates to the physical proximity of local services—namely, post offices, primary schools, general stores, supermarkets and GP surgeries. Proximity to these services is measured by road distance.[266] The 'wider barriers' sub-domain is composed of three indicators:[267]

- **household overcrowding**—i.e. the proportion of all households judged to have insufficient space to meet the household's needs;
- **homelessness**—i.e. the LAD-level rate of acceptances for housing assistance;

[265] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[266] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[267] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.

- **housing affordability**—i.e. the ability to enter owner-occupation or the private rental market without assistance from Housing Benefit.

A4.61 The relevant indicators within the two sub-domains are standardised by ranking, transformed to a Normal distribution, and then combined using equal weights. In turn, the sub-domains are combined using the same transformation to create the overall Barriers to Housing and Services domain score.[268] The result of this construction is that the 'housing affordability' indicator has an important weight in determining a LAD's performance with respect to housing and services deprivation. The housing affordability indicator itself compares house prices and rents with the income of each household's primary earner, excluding income from means-tested benefits.[269]

A4.62 The end result is that, when the particularly high house prices in the South East of England (30% higher by average price paid than in England as a whole)[270] are combined with the construction of the housing affordability indicator and that indicator's weight within the Barriers to Housing and Services' domain, LADs in the South East, such as those in the Gatwick Diamond, perform particularly poorly on the Barriers Housing and Services index.

A4C Coast to Capital LEP

A4.63 Box A4.2 summarises the key characteristics of the Coast to Capital LEP that we examine in this section.

Box A4.2 Key characteristics of the Coast to Capital LEP

- **Population growth**: the Coast to Capital LEP showed relatively high rates of population growth between 2007 and 2014, driven by international migration (from the rest of the world) and, to a lesser extent, internal migration (from the rest of the UK).
- **Employment**: the data shows that the Coast to Capital LEP is characterised by relatively high rates of employment and economic activity.
- **Occupational levels**: a higher proportion of residents in the Coast to Capital LEP are employed in senior occupations than in the rest of England.
- Workplace **earnings** are below the national average; however, there is significant out-commuting, resulting in above-average resident earnings.
- Correspondingly, residents also tend to have higher levels of **educational attainment**.
- The **economy** contains a large proportion of SMEs and businesses in professional/technical fields.
- **Unemployment** rates are relatively low and tend to persist for shorter periods of time. Sales and retail jobs are especially sought-after, and this trend has grown over time.

Source: Oxera.

A4C.1 Population

A4.64 This section focuses on the composition of the population in the Coast to Capital LEP, and the drivers of change over time. In particular, we consider overall population growth and the distribution of age profiles in the area, both of which have implications for labour supply.

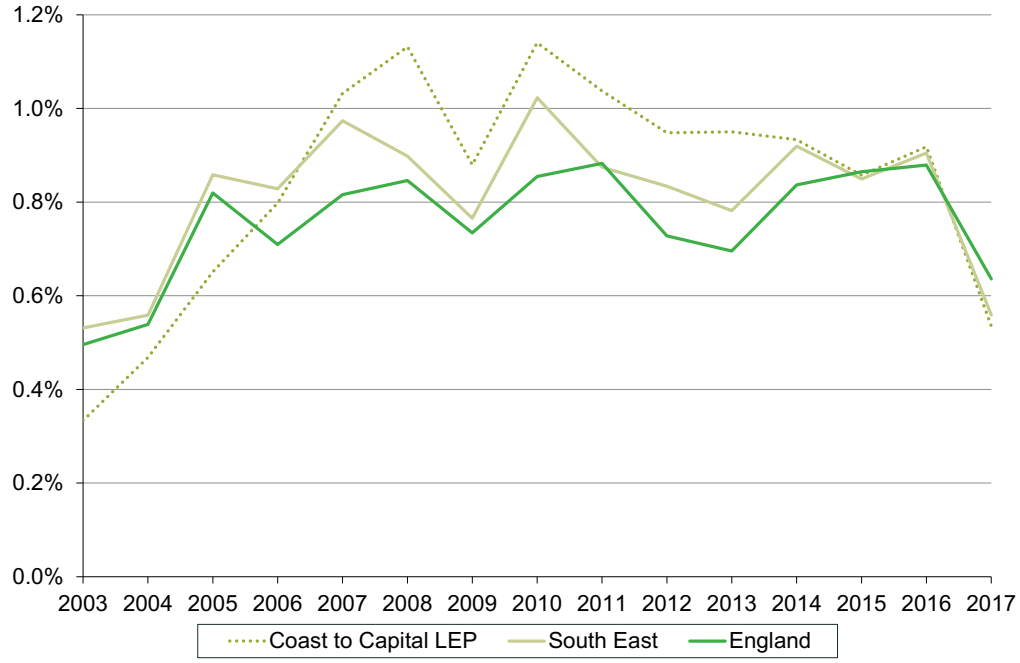
[268] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 55.
[269] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 53.
[270] Office for National Statistics (2019), 'Median house prices for administrative geographies: HPSSA dataset 9', March.

Population growth

A4.65 The population of the Coast to Capital LEP was 2.0m in 2017, and has grown by 13% since 2002.[271]

A4.66 Between 2007 and 2014, annual population growth in the Coast to Capital LEP exceeded those of both the South East and England. However, in recent years, growth has fallen back in line with the regional and national rates, as shown in Figure A4.21.

Figure A4.21 Year-on-year population growth

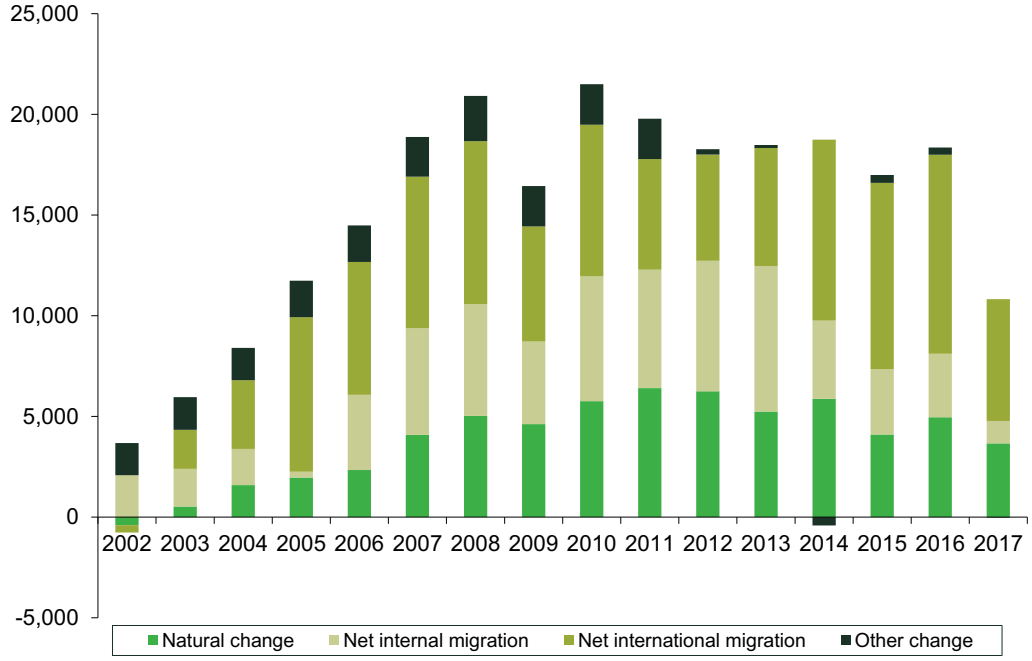


Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.67 These fluctuations in population growth rates in the LEP appear to have been driven largely by international migration, and, to a lesser extent, by internal migration, as shown in Figure A4.22. International migration was the largest contributor to population growth in the LEP between 2003 and 2010, and between 2014 and 2017, with internal migration accounting for the largest share in the intervening years.

[271] Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

Figure A4.22 Components of population change, Coast to Capital LEP



Note: Natural change is the difference between the number of live births and deaths during each year. Internal migration is defined as residential moves between different LADs in the UK, including those that cross the boundaries between the four UK nations: England, Wales, Scotland, and Northern Ireland. International migration is defined as residential moves to a country other than that of the person's usual residence. Other changes comprise changes to the size of armed forces stationed in the UK and other special population adjustments.

Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.68 According to ONS projections, the population of the LEP will continue to grow, but at a slower rate, with a predicted growth of 15.1% by 2041.[272] This is above the forecast 12.6% population growth in the South East and 11.4% in England. The population growth is forecast to be driven primarily by internal and international migration.

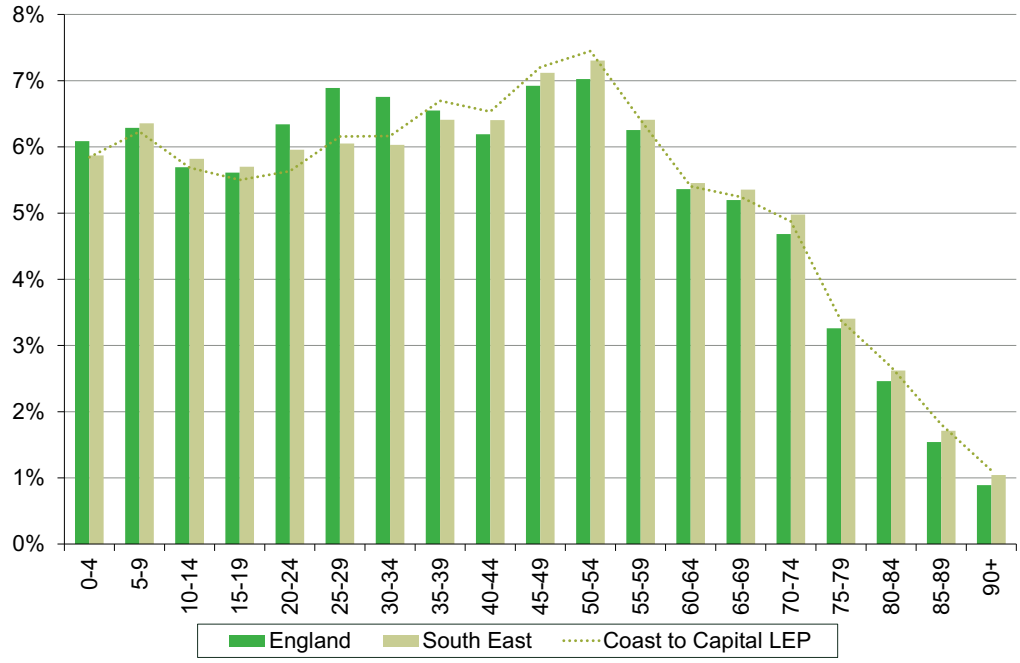
Distribution of ages

A4.69 Working age is defined as people between the ages of 16 and 64 (inclusive).[273] On this basis, the working age population of the Coast to Capital LEP is slightly below the national average. 62.1% of the population here is of working age, compared with 62.8% of England's population (see Figure A4.23). However, it is slightly above the regional average, as 61.8% of the population in the South East is of working age.

A4.70 The distribution of the working age population is more varied. The Coast to Capital LEP has a larger proportion of its population between the ages of 35 and 54 than the South East and England; however, it has a lower proportion of the population in their 20s and early 30s than England. This is driving the lower proportion of people of working age in the LEP compared with England.

[272] Office for National Statistics (2019), 'Population projections incorporating births, deaths and migration for regions and local authorities: Table 5', 9 April.
[273] NOMIS (2010), 'Working age', 11 August, https://www.nomisweb.co.uk/articles/487.aspx, accessed 25 April 2019.

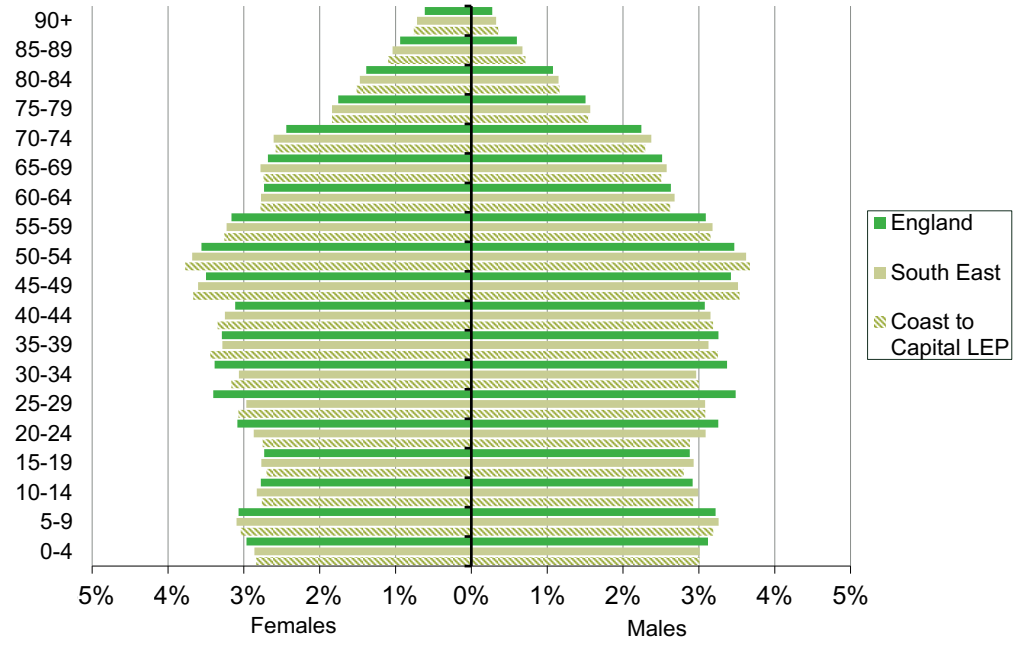
Figure A4.23 Population by age



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.71 Data on population by gender suggests that the differences in age profile between the Coast to Capital LEP and the South East and England are not gender-specific. For instance, in the 50–54 age group, the Coast to Capital LEP has a larger share of both males and females.

Figure A4.24 Population pyramid



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4C.2 Education

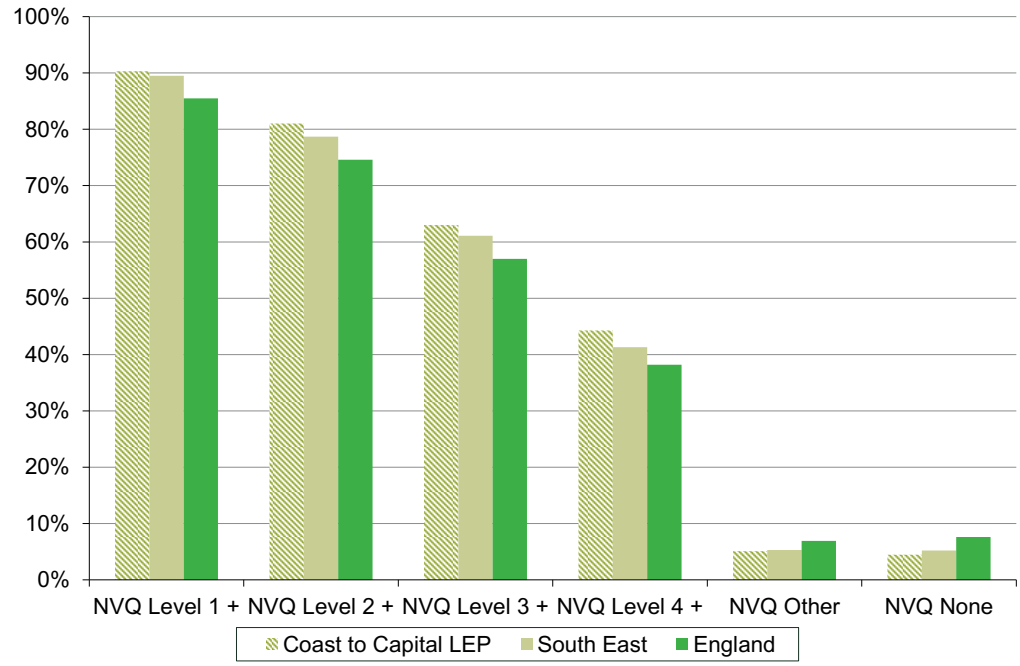
A4.72 Below we discuss educational attainment and the availability of higher education in the Coast to Capital LEP.

Qualifications

A4.73 On average, the population of the Coast to Capital LEP is educated to a higher level than the population in the South East or England. As shown in Figure A4.25, 90% of the working age population in the Coast to Capital LEP has at least an NVQ Level 1 qualification, and over 40% has Level 4 or above. However, there is an uneven distribution of qualifications within the LEP. For example, 51.9% of the population in Epsom and Ewell has a degree-level qualification (NVQ Level 4), compared with just 24.0% in Arun. The Coast to Capital LEP has identified this as an area of concern, and a potential cause of slower economic growth in the area:

> ... the area does have areas of lower skilled residents ... Despite areas such as Epsom and Ewell and Brighton & Hove having over 50% highly qualified populations there are places such as Crawley, Chichester and Worthing which have NVQ4+ levels (degree level or equivalent) 4% lower than the local average and are only just in line with the national level. Along the coast, Adur and Arun are 14-17% below the local average; these local disparities create mismatched local labour markets that affect the level of high skilled businesses and jobs that can be supported in different areas.[274]

Figure A4.25 Qualification level of the working age population, as in 2017



Note: NVQ Level 1 is GCSE (grades D–G) or equivalent; NVQ Level 2 is GCSE (grades A*–C) or equivalent; NVQ Level 3 is AS and A Level or equivalent; NVQ Level 4 includes any certificate of higher education.

Source: NOMIS (2019), 'Annual population survey', 22 January.

[274] Coast to Capital (2018), 'Gatwick 360: Strategic Economic Plan 2018-2030', p. 60.

Higher education

A4.74 The Coast to Capital LEP contains four universities (University of Sussex; University of Brighton; University for the Creative Arts, Epsom; and University of Chichester), and seven further education colleges delivering higher education courses.[275] In 2017:

- 95.3% of undergraduate leavers from the University of Sussex were in employment or further study within six months of graduating;[276]
- 92.6% of undergraduate leavers from the University of Brighton were in employment or further study within six months of graduating;[277]
- 96.9% of undergraduate leavers from the University for the Creative Arts were in employment or further study within six months of graduating;[278]
- 95.4% of undergraduate leavers from the University of Chichester were in employment or further study within six months of graduating.[279]

A4.75 Three of these four universities have above the national average graduate employment rate of 94.4%, with the University of Brighton having a below-average graduate employment rate.[280]

A4.76 While there are several universities in the area, the supply of places appears to be less abundant when put into the context of the number of potential students in the area. There are a below-average number of university places per 16- to 18-year-old in the Coast to Capital LEP: 0.31 university places versus 0.55 across England. This could:

- reduce the number of young people who want or are able to stay in the area for higher education;
- reduce the number of young people who are attracted to the area.

A4.77 In its Strategic Economic Plan 2018–30, the LEP has identified the need to develop strong partnerships between education and skills providers and employers in order to 'up-skill and re-skill the adult workforce', as well as provide accessible education and training for everyone:

> Our ambition is to boost the productivity of our economy by giving people the skills they need not only to secure and maintain high-quality jobs, but also to make their way through a potential portfolio of careers over their lifetime, earning an income that enables them to remain living within the area ... We need a further education sector that can adapt quickly to the changing requirements of the economy and local business needs.[281]

A4.78 Funding, both for investment in skills infrastructure and for ongoing training of the adult workforce, has been identified as a specific action to deliver the LEP's ambition.[282]

[275] Further education is education below degree level for people above school age. Higher education is education at universities or similar educational establishments, especially to degree level.
[276] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[277] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[278] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[279] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[280] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[281] Coast to Capital (2018), 'Gatwick 360: Strategic Economic Plan 2018-2030', p. 37.
[282] Coast to Capital (2018), 'Gatwick 360: Strategic Economic Plan 2018-2030', pp. 38–39.

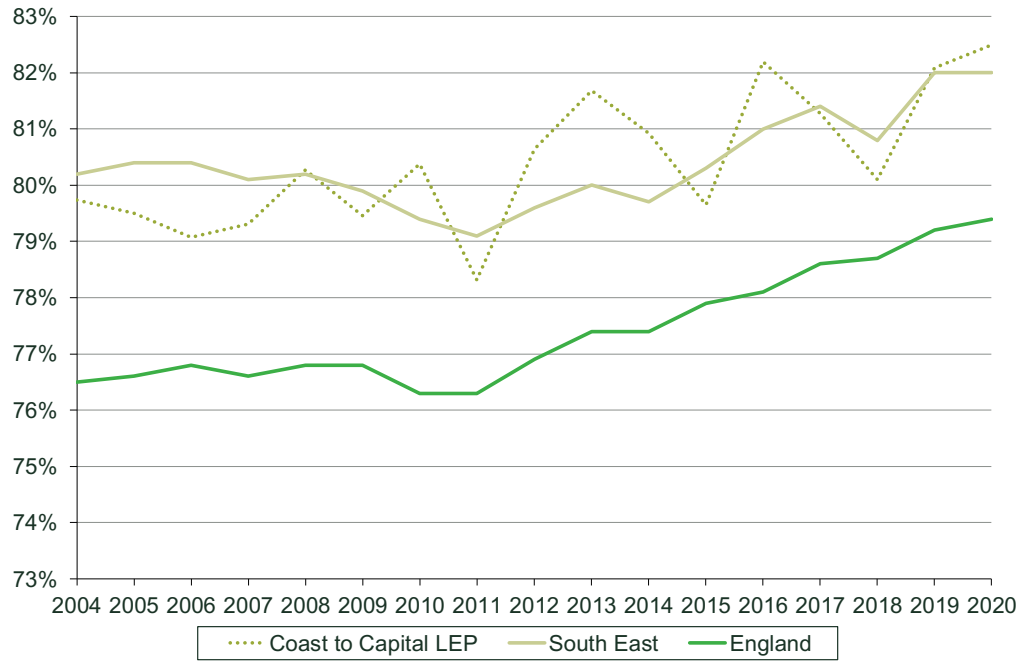
A4C.3 Labour market

A4.79 This section examines the composition of the labour market by looking at trends in employment and unemployment over time and within sectors.

Economic activity

A4.80 Economic activity in the Coast to Capital LEP is higher than in England, and roughly in line with that in the South East, with 82% of the working age population economically active in 2019. This has been on a slight upward trend since 2004, although the trend exhibits a significant amount of fluctuation that is not seen in the wider geographic areas (see Figure A4.26). There is also significant variation among the LADs that make up the LEP. For example, in 2017, Adur had an economic activity rate of over 90%, whereas Lewes had an economic activity rate of only 76%.

Figure A4.26 Economic activity over time



Note: Data is available from 2004 only. Data for 2020 refers to the economically active population between October 2019 and September 2020, which is the latest period for which data is available. Share of economically active population is weighted by the active population in each of the LADs in the study areas.

Source: NOMIS (2021), 'Annual population survey', January.

Employment

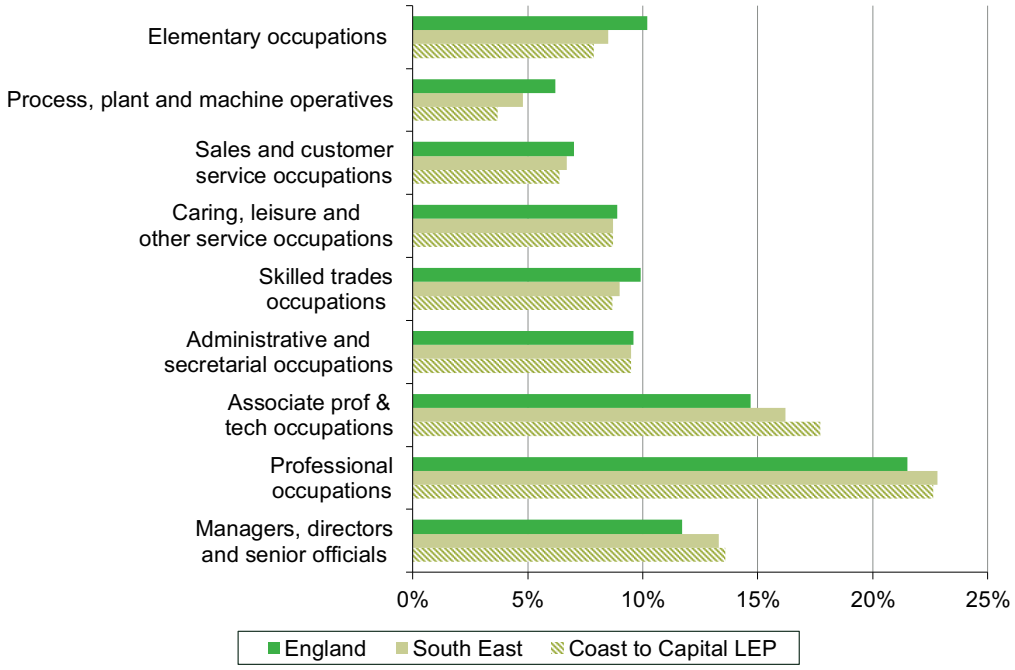
A4.81 We use ONS data to examine employment patterns in more detail. Again, we use the South East and England as benchmarks for comparison. The data suggests that residents in the LEP are employed predominantly in professional occupations, associate/technical occupations and managerial functions, with 54% of residents employed in these three occupational groups.

A4.82 The share of employment in these occupations is also slightly higher than in the South East, with the exception of professional occupations, and materially higher than in England, as shown in Figure A4.27.

A4.83 ONS data suggests that managerial and administrative occupations—two occupation groups for which the Coast to Capital LEP has particularly high

concentrations of employment—have a higher age profile of employees, with high proportions above the age of 45. This is consistent with the age profile of the working age population in the LEP.

Figure A4.27 Employment by occupation in 2019



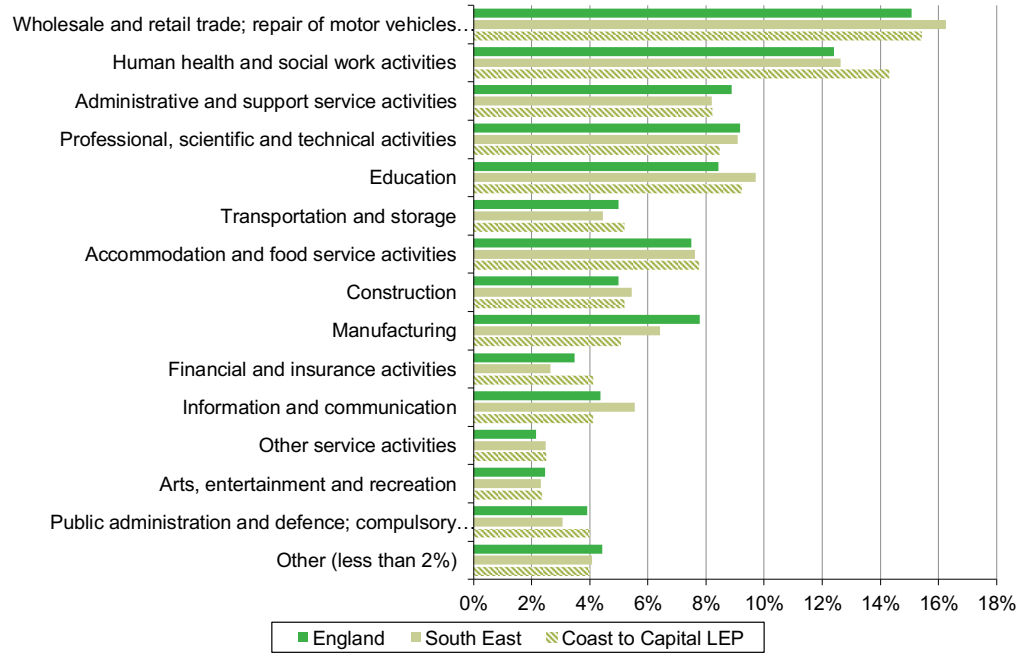
Note: Estimates of population in employment in each LAD are used as weights in each occupation and study area.

Source: NOMIS (2021), 'Annual population survey', January.

A4.84 The data also shows that employment in the Coast to Capital LEP is predominantly in service industries (see Figure A4.28 below). The share of employment in human health and social work activities, transportation and storage, and financial and insurance activities industries is larger in the LEP than in the South East or England. Conversely, the LEP has a lower share of employment in the manufacturing, professional, scientific and technical activities, and in information and communication industries.

A4.85 The large share of employment in the transportation and storage industry in the LEP is likely to be driven in part by the presence of Gatwick Airport. This is supported by the fact that a significant proportion (51.4%) of the LEP's employment in the transportation and storage industry is in Crawley, which suggests that Gatwick Airport and businesses related to Gatwick Airport are driving the large share of employment in this sector.

Figure A4.28 Employment by industry



Note: Employment for calendar year 2019.

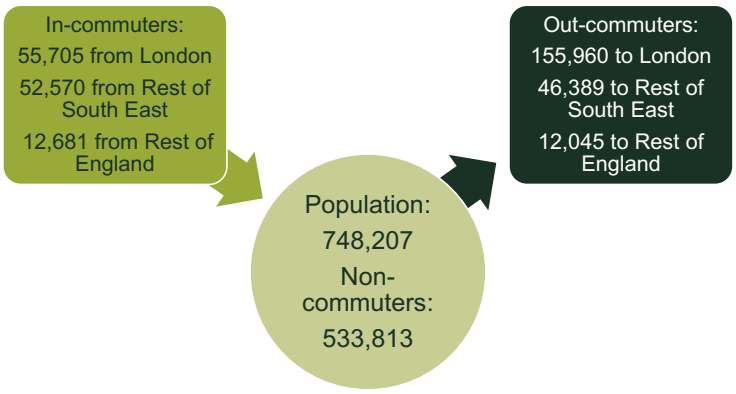
Source: NOMIS (2021), 'Business Register and Employment Survey: open access'.

Commuting patterns

A4.86 Data on commuting patterns is available only from the 2011 Census of Population; therefore, in this section we use the most recent data available.[283]

A4.87 In 2011, there was a net commuter flow out of the LEP. The majority of the LEP's population (71.3%) were working in the LEP, but out-commuters exceeded in-commuters by over 93,000 people.[284] The majority of commuters were either commuting in from, or out to, London.

Figure A4.29 Commuting patterns, 2011



Note: The population includes only working age residents who were in employment at the time of surveying.

Source: Office for National Statistics (2011), 'Census of population, 2011'.

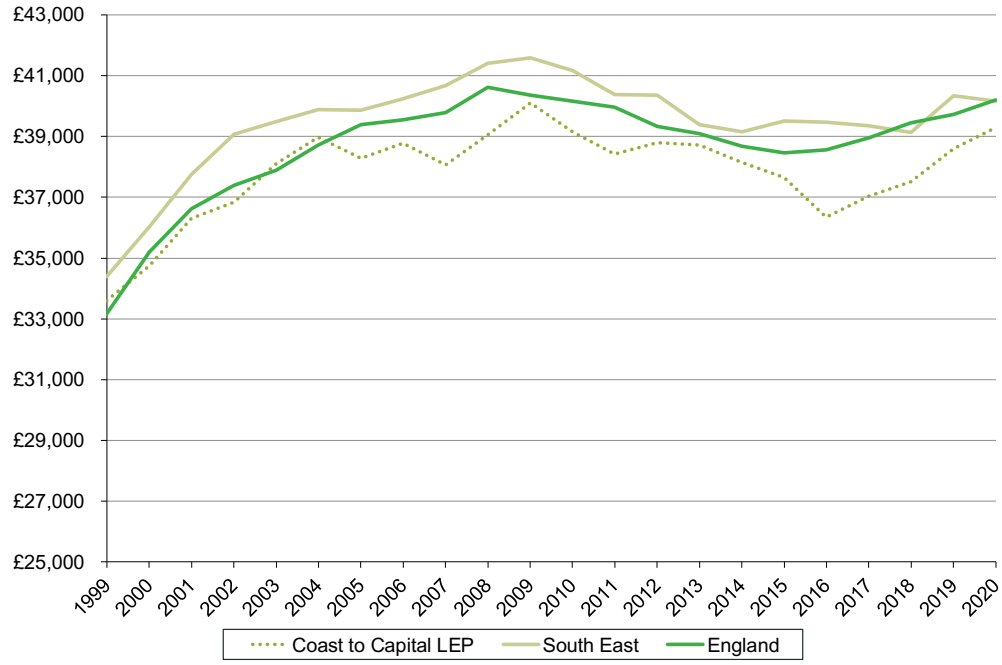
[283] This is consistent with other recent DCO applications.
[284] This considers only the population of working age residents in the LEP who were in employment at the time of surveying.

Earnings

A4.88 Employees in the LEP tend to have lower earnings than the average for England; however, residents of the LEP have above-average earnings.

A4.89 On a workplace earnings definition, real earnings have declined more in the LEP since 2005 than in the South East and England, although after 2016 there is an upward trend, as shown in Figure A4.30. In 2019, workplace-based earnings in the LEP were approximately £1,100 below the national average.

Figure A4.30 Mean annual full-time earnings (real 2021), workplace-based



Source: NOMIS (2021), 'Annual survey of hours and earnings – workplace analysis'.

A4.90 Conversely, as shown in Figure A4.31 below, the earnings of residents have consistently been higher in the LEP than in England. In 2019, residence-based earnings were approximately £2,800 per year above the national average.

Figure A4.31 Mean annual full-time earnings (real 2021), residence-based

Source: NOMIS (2021), 'Annual survey of hours and earnings – resident analysis'.

A4.91 The disparity between workplace-based and residence-based earnings could be explained by some of the characteristics of the working age population as well as the structure of the local economy. Below, we explore these factors in turn.

Location of employment

A4.92 There is significant out-commuting from the LEP to London, which could explain the low workplace earnings but high resident earnings, as people may be travelling further for higher earnings in industries paying above-average wages.

Education level

A4.93 Educational attainment is positively correlated with income. Therefore, the higher-than-average education level of residents of the LEP is also likely to contribute to higher residence-based earnings.

Age of employees

A4.94 ONS analysis suggests that average hourly wages are positively correlated with age until the age of 50. On average, wages peak between the ages of 35 and 50.[285] This could explain, to some extent, the resident-earnings gap between the Coast to Capital LEP and the regional and national comparators, as there is a larger-than-average proportion of the population between the ages of 35 and 54 in the LEP.

Industrial mix of workplace employment

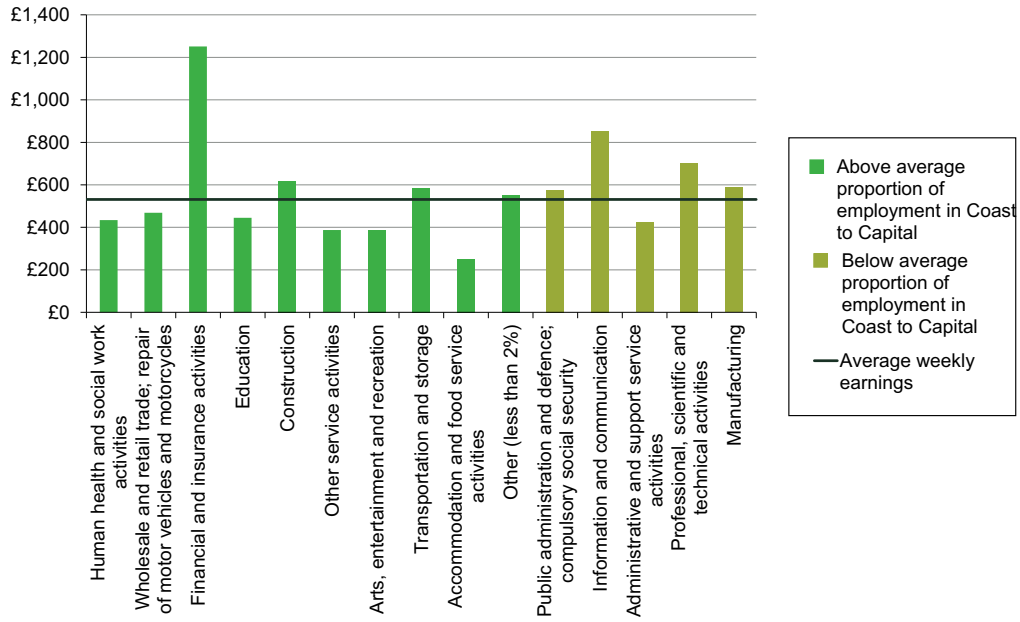
A4.95 The industries within the Coast to Capital LEP that have a higher-than-average proportion of employment also tend to have lower-than-average wages or close to average wages, with the exception of financial and insurance services.

[285] Office for National Statistics (2018), 'Public and private sector earnings in the UK: 2017', 2 November.

This is consistent with the lower earnings seen among employees within the LEP.

A4.96 For example, average weekly earnings in the human health and social work activities industry are almost £100 below the average across all industries. The administrative and support service activities, and accommodation and food service activities industries, also have below-average weekly earnings, as shown in Figure A4.32. The industries in which average weekly earnings are below average comprise 61.0% of total employment, compared with 59.1% in the South East and 57.7% in England. The lower-than-average earnings of the prominent industries in the LEP is reflected in average annual wages, which have been lower in the LEP than in the South East or England since 2004.

Figure A4.32 Average weekly earnings by industry



Note: Price base year is 2018. Average weekly earnings are calculated as the average earnings in the UK in each industry weighted by the proportion of total employment in the LEP. The proportion of employment is compared against the national average.

Source: Office for National Statistics (2019), 'Average weekly earnings by industry (Monthly Wages and Salaries Survey)', 19 March.

Unemployment

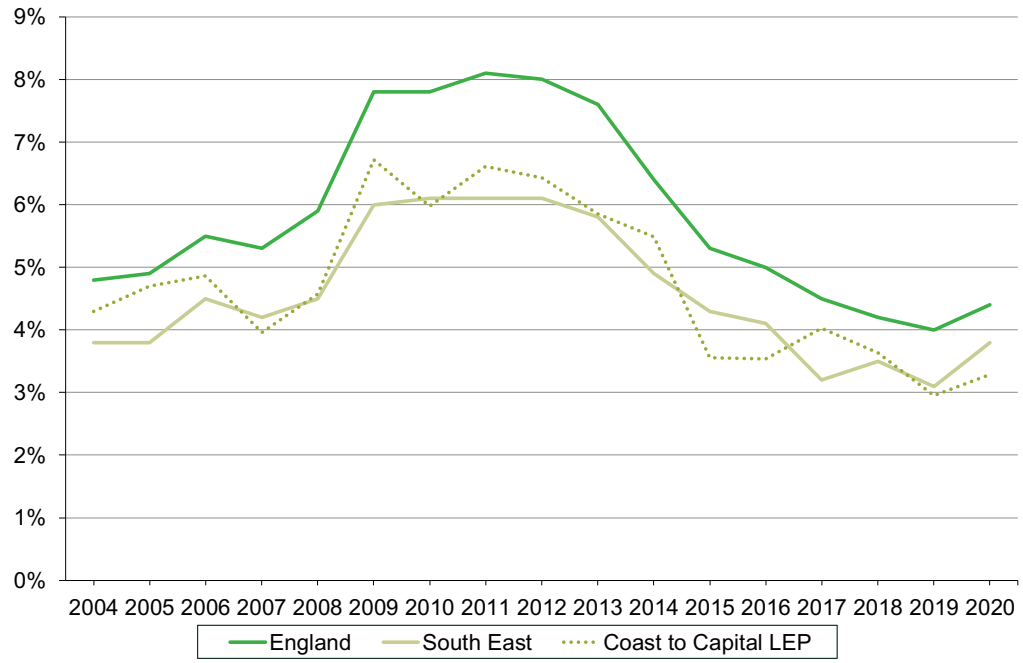
A4.97 There are two ways to measure unemployment: using the claimant count (total number of people eligible to claim Jobseeker's Allowance), and using the LFS (total number of people without any kind of job, who have looked for work in the last month and are available to start work immediately).

A4.98 LFS data is not available at the local authority level, so we have used APS data, which combines data from two waves of the LFS with the continuous household survey data collected in the APS.

A4.99 Unemployment is consistently lower in the LEP than in England. The unemployment rate in the LEP rose to almost 7% in 2009 during the 2008 recession, but has since fallen to approximately 3.2% in 2020. On average, it has been 1 percentage point below the national average since 2004. Figure A4.33 shows how unemployment has changed over time. The trend has been

similar in the LEP to that seen in the wider economy, displaying the same increase following the 2008 recession.

Figure A4.33 Unemployment over time

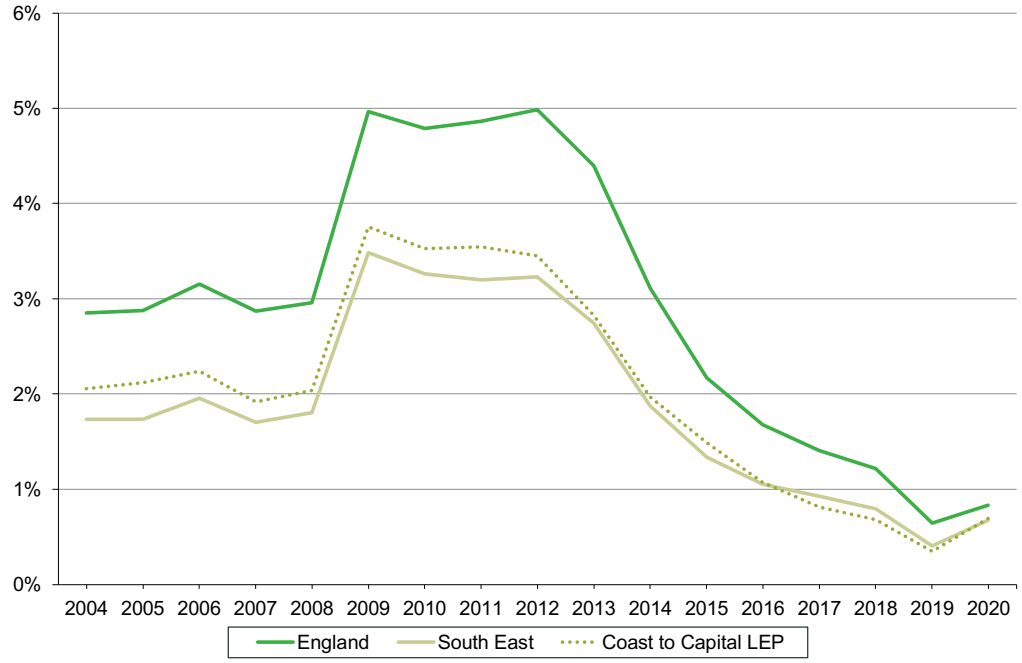


Note: Unemployment rate calculated as a proportion of the economically active population who are unemployed from January to December, with the exception of 2020, where data from October 2019 to September 2020 was used.

Source: NOMIS (2021), 'Annual population survey', January.

A4.100 The proportion of the economically active population claiming Jobseeker's Allowance has historically been in line with that in the South East but consistently lower than that in England, as shown in Figure A4.34. The proportion of people claiming Jobseeker's Allowance has moved with a similar trend to unemployment over the period.

Figure A4.34 Claimant count



Note: Claimant count calculated as the average proportion of the economically active population claiming Jobseeker's Allowance between January and December, with the exception of 2020, where data from October 2019 to September 2020 was used.

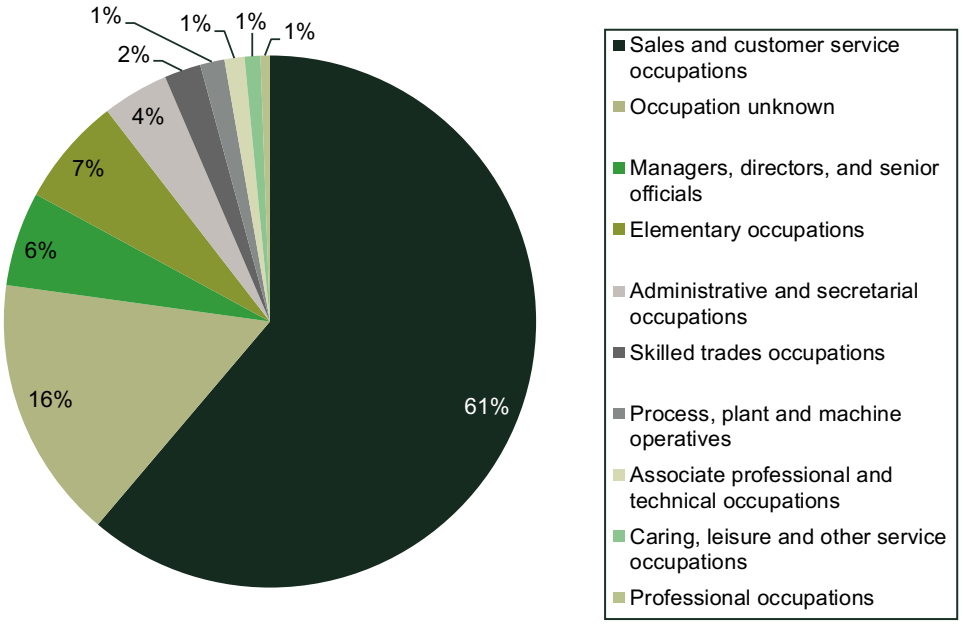
Source: NOMIS (2021), 'Jobseeker's Allowance with rates and proportions', March.

A4.101 The data suggests that periods of unemployment in the LEP are also relatively short. On average, the claim period in the LEP is shorter than in England, with 16.2% claiming for less than one month in the LEP, compared with 12.6% in England, and 27.0% claiming for longer than six months, compared with 44.6% in England.

A4.102 As shown in Figure A4.35, sales and customer service occupations, such as retail and telephone sales, are the most highly sought-after occupations in the LEP, with more than 60% of claimants seeking these occupations. Sales occupations comprise just 6% of employment in the LEP, and a similarly low proportion in the South East and England. This indicates an excess supply and, consequently, high levels of unemployment for sales occupations in the LEP but also throughout the country. It may also indicate a higher churn rate in sales and customer service occupations than in other occupations.

A4.103 Conversely, professional occupations make up the largest proportion of employment but the smallest proportion of unemployment, indicating low rates of unemployment in professional occupations. Managerial and administrative occupations also comprise a significant proportion of employment in the LEP, and a lesser proportion of unemployment in the LEP. These trends are consistent with the South East and England, suggesting that this is a sector-wide pattern.

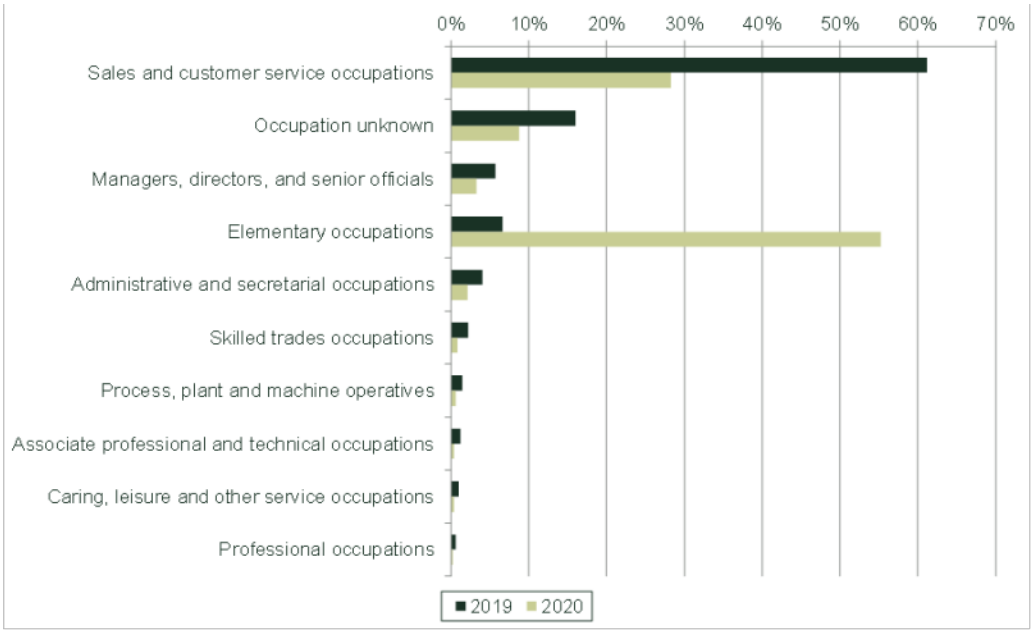
Figure A4.35 Jobseeker's Allowance by occupation sought in the Coast to Capital LEP, as in 2019



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.104 Figure A4.36 below shows the difference between 2019 and 2020 data in Jobseeker's Allowance by occupation sought. As can be seen in the chart, a shift happened in the most sought-after occupations from 'sales and customer service occupations' to 'elementary occupations'. This shift translates the effect of pandemic-induced restrictions on the ability of certain sections of employment to work. While 'sales and customer service occupations' were able to continue working remotely, a number of people in the 'elementary' occupations' might not have been able to do so and were unlikely to have been directly affected by the furlough scheme because of temporary work contracts (e.g. in the food and accommodation sector).

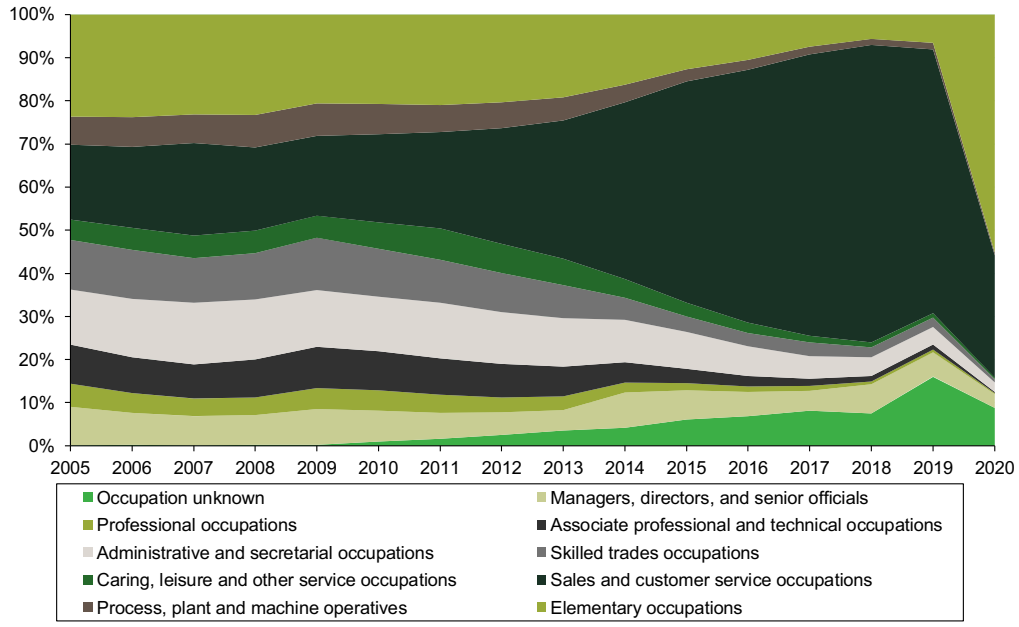
Figure A4.36 Jobseeker's Allowance by occupation sought in the Coast to Capital LEP, as in 2019 and 2020



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.105 Historically, elementary occupations were the most highly sought-after occupations; however, since 2012, the proportion of claimants seeking sales occupations has risen rapidly. Figure A4.37 shows the change in occupations sought by claimants over time.

Figure A4.37 Jobseeker's Allowance by occupation sought, Coast to Capital LEP



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4C.4 Economy

A4.106 This section examines the composition of the business population in the Coast to Capital LEP relative to the regional and national comparators.

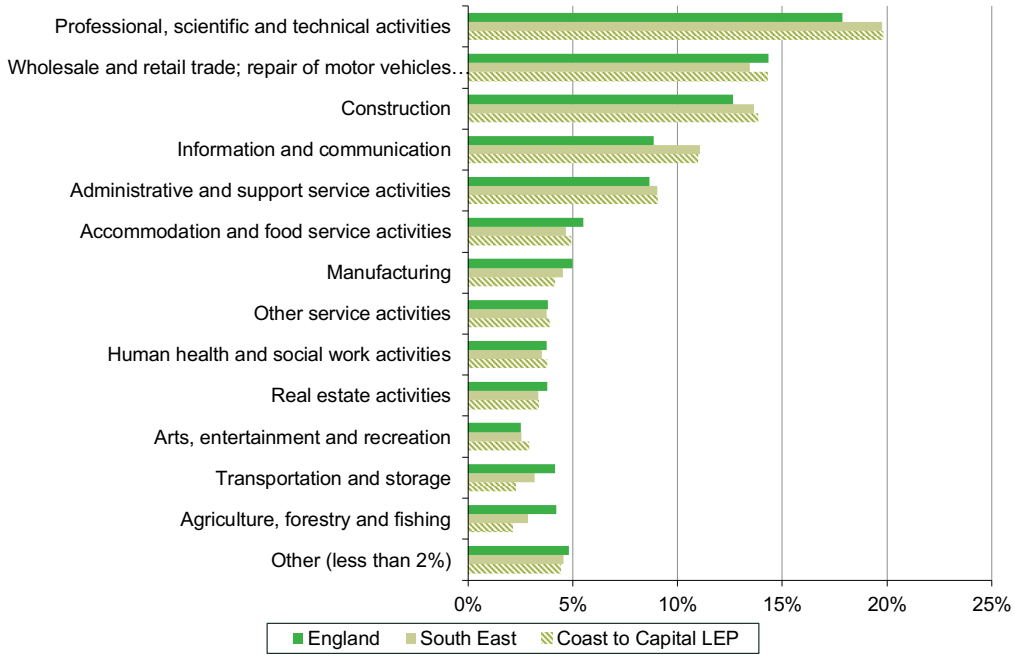
Enterprise

A4.107 The prevalence of the professional, scientific and technical activities industry has been increasing over time in the LEP, in line with national and regional trends. However, this has consistently been the largest industry by number of businesses in the LEP, whereas it became the largest industry nationally only in 2013. Prior to this, wholesale and retail trade was the largest industry, and is still the largest employer in the LEP and the regional and national comparators.

A4.108 There are approximately 92,600 enterprises in the Coast to Capital LEP.[286] This number has been increasing steadily over time, in line with the South East and England. Compared with the regional and national comparators, a larger proportion of enterprises in the LEP are SMEs and fall into the £100,000–£499,000 turnover band. However, a below-average proportion of enterprises fall into the turnover bands of £500,000 and above.

A4.109 The industries in which the Coast to Capital LEP has a higher proportion of enterprises than the South East and England are generally consistent with the industries in which employment is higher. However, the LEP has a much larger proportion of employment in the transportation and storage industry than either the South East or England, but has a lower proportion of enterprises in that industry. This suggests that there is a prevalence of larger transport businesses in the Coast to Capital LEP, consistent with the location of Gatwick Airport.

Figure A4.38 Enterprises by industry, as in 2019



Note: This is representative of the number of businesses in each industry and is not indicative of revenues in each industry.

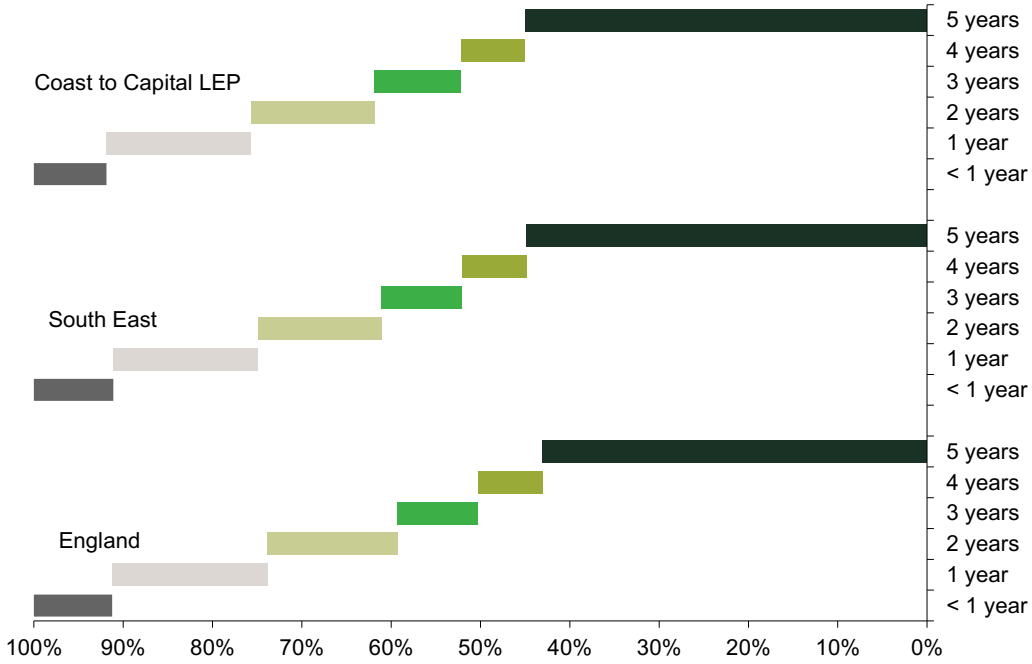
Source: NOMIS (2021), 'UK Business Counts', March.

A4.110 Businesses in the LEP have a slightly higher survival rate than the national average. Figure A4.39 shows the survival rate of new businesses launched in 2012. The data shows that a slightly larger proportion of new businesses survived the first five years in the LEP (45.0%) than in England (43.1%). The

[286] NOMIS (2018), 'UK Business Counts', 10 March.

business survival rate is in line with the survival rate of the South East, in which 44.8% of businesses survived the first five years.

Figure A4.39 Business survival rate (launched in 2012)



Source: Office for National Statistics (2018), 'Business demography, UK', 21 November.

Deprivation

A4.111 This section examines the level of deprivation in the Coast to Capital LEP relative to the regional and national comparators.

Deprivation indices

A4.112 The IMD provides a set of relative measures of deprivation by area. It is calculated using seven domains of deprivation (Income Deprivation; Employment Deprivation; Education, Skills and Training Deprivation; Health Deprivation and Disability; Crime; Barriers to Housing and Services; Living Environment Deprivation). There are two supplementary indices (the Income Deprivation Affecting Children Index and the Income Deprivation Affecting Older People Index) in addition to the IMD and the seven domains.

A4.113 There is a lot of variation in the levels of deprivation across the Coast to Capital LEP. Several of the LADs perform well in most domains and sub-domains, for example, six of the 14 LADs perform in the top 50% for eight of the nine domains and sub-domains, and the overall IMD. However, most of the 14 LADs perform worse in barriers to housing and services than in other domains. This is likely to be driven by the affordability of housing. Based on the median affordability ratio, workers in the Coast to Capital LEP could expect to pay between 9 and 16 times their annual gross full-time earnings, compared with 8 times earnings in England as a whole and 10 times in the South East.[287] Thirteen of the 14 LADs have a higher affordability ratio than the South East, with only Crawley having a lower wage to house price ratio than the South East average.

[287] Office for National Statistics (2021), 'House price to workplace-based earnings ratio', 25 March.

A4.114 Conversely, Brighton and Hove and Croydon perform badly in most deprivation indices, and are in the bottom 50% of the most deprived LADs for eight of the nine domains and sub-domains, as well as for the overall IMD. The only domain in which the two LADs perform in the top 50% is education, skills and training deprivation. This can be seen in further detail in Table A4.2.

A4.115 The differences in deprivation between the LADs suggests that there are significant differences within the individual economies making up the Coast to Capital LEP, despite the area performing well in many economic indicators as a whole.

Figure A4.40 Index of Multiple Deprivation

Note: The IMD rank is the rank of the average rank within the LAD. There are 317 LADs in England; 1 is the most deprived and 317 is the least deprived. The lowest rank on the map is for Croydon (102), and the highest rank is for Mid Sussex (311).

Source: Ministry of Housing, Communities & Local Government (2019), 'English Indices of Deprivation 2019', 26 September.

Table A4.2 Indices of deprivation

	Epsom and Ewell	Mole Valley	Reigate and Banstead	Tandridge	Crawley	Horsham	Mid Sussex	Brighton and Hove	Croydon	Lewes	Worthing	Arun	Chichester	Adur
Income deprivation	96	86	98	87	42	98	95	38	28	56	54	49	74	45
Employment deprivation	96	88	91	85	55	97	91	48	40	52	44	42	73	44
Education, skills and training deprivation	95	83	94	77	16	88	89	67	64	47	48	28	71	22
Health deprivation and disability	95	79	87	79	45	97	88	38	52	63	47	35	66	44
Crime	45	58	75	32	37	85	87	47	23	74	71	61	83	67
Barriers to housing and services	51	38	39	37	12	59	24	29	5	28	82	21	22	74
Living environment deprivation	71	55	59	53	65	88	68	27	22	78	18	75	34	37
Income deprivation affecting children	93	85	98	84	38	97	96	50	25	56	59	50	71	48
Income deprivation affecting older people	95	90	98	94	36	96	97	14	33	65	52	59	81	43
IMD	**94**	**87**	**93**	**81**	**43**	**98**	**91**	**44**	**32**	**61**	**55**	**47**	**67**	**52**

Note: All numbers represent the percentile in which the LAD rank falls for each index; with 1% being the most deprived LADs. The LAD rank is calculated as an average of the LSOA ranks within the LAD.

Source: Ministry of Housing, Communities & Local Government (2019), 'English Indices of Deprivation 2019', 26 September.

Contextualisation of observed high barriers to housing and services in the Coast to Capital LEP

A4.116 We see from Table A4.2 that the LADs in the Coast to Capital LEP have relatively high scores on the Barriers to Housing and Services Deprivation index. This poor performance can be explained by the combination of that index's construction and the special conditions of the housing market in the South East of England, within which the Gatwick Diamond lies.

A4.117 The Barriers to Housing and Services Index measures the physical and financial accessibility of housing and local services via two 'sub-domains': geographical barriers and wider barriers.[288] The 'geographical barriers' subdomain relates to the physical proximity of local services, namely post offices, primary schools, general stores, supermarkets and GP surgeries. Proximity to these services is measured by road distance.[289] The 'wider barriers' sub-domain is composed of three indicators:[290]

- **Household overcrowding**—i.e. the proportion of all households judged to have insufficient space to meet the household's needs;
- **Homelessness**—i.e. LAD-level rate of acceptances for housing assistance and;
- **Housing affordability**—i.e. the ability to enter owner-occupation or the private rental market without assistance from Housing Benefit.

A4.118 The relevant indicators within the two sub-domains are standardised by ranking, transformed to a Normal distribution and then combined using equal weights. In turn, the sub-domains are combined using the same transformation to create the overall Barriers to Housing and Services domain score.[291] The result of this construction is that the 'housing affordability' indicator has an important weight in determining a LAD's performance with respect to housing and services deprivation. The housing affordability indicator itself compares house prices and rents to the income of each household's primary earner, excluding income from means-tested benefits.[292]

A4.119 The end result is that, when the particularly high house prices in the South East of England (30% higher by average price paid than in England as a whole)[293] are combined with the construction of the housing affordability indicator and that indicator's weight within the 'Barriers to Housing and Services' domain, LADs in the South East, such as those in the Gatwick Diamond, perform particularly poorly on the Barriers to Housing and Services index.

A4D Five Authorities

A4.120 Box A4.3 summarises the key characteristics of the Five Authorities area that we will be examining in this note.

[288] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[289] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[290] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[291] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 55.
[292] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 53.
[293] Office for National Statistics (2019), 'Median house prices for administrative geographies: HPSSA dataset 9', March.

Box A4.3 Key characteristics of the Five Authorities area

- **Population growth**: the Five Authorities area showed relatively high growth between 2006 and 2009, primarily driven by internal migration (from the rest of the UK).
- **Employment**: the data shows that the Five Authorities area is characterised by employment and economic activity in line with the wider South East region.
- **Occupational levels**: a higher proportion of residents in the Five Authorities are employed in senior occupations that the rest of England, but a similar proportion to the South East.
- Workplace **earnings** are below the national average; however, there is significant out-commuting to London resulting in higher resident earnings. The **economy** features a large proportion of SMEs and businesses in professional/technical fields.
- **Unemployment** rates are relatively low and also tend to be for shorter periods of time. Sales and retail jobs are especially sought-after and this has grown over time.

Source: Oxera.

A4D.1 Population

A4.121 This section focuses on the composition of the population in the Five Authorities area, and the drivers of change over time. In particular, we consider overall population growth and the distribution of age profiles in the area, both of which have implications for labour supply.

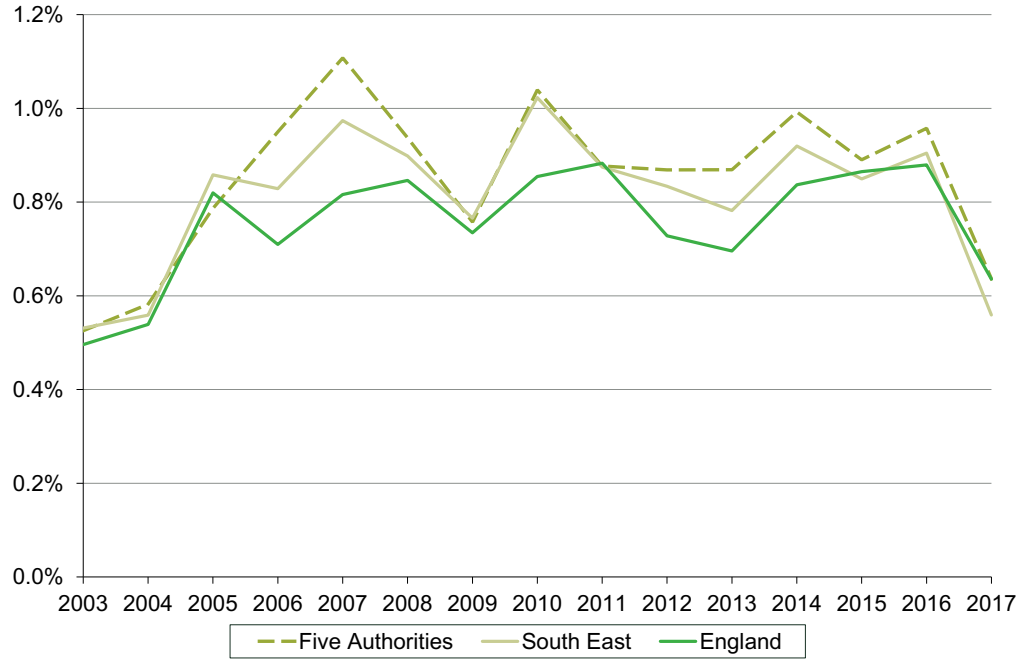
Population growth

A4.122 The population of the Five Authorities area was 4.6m in 2017, and has grown by 13% since 2002.[294]

A4.123 Between 2006 and 2009, annual population growth in the Five Authorities area exceeded both the South East and England. However, in recent years, growth has been in line with the regional and national rates, as shown in Figure A4.41.

[294] Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

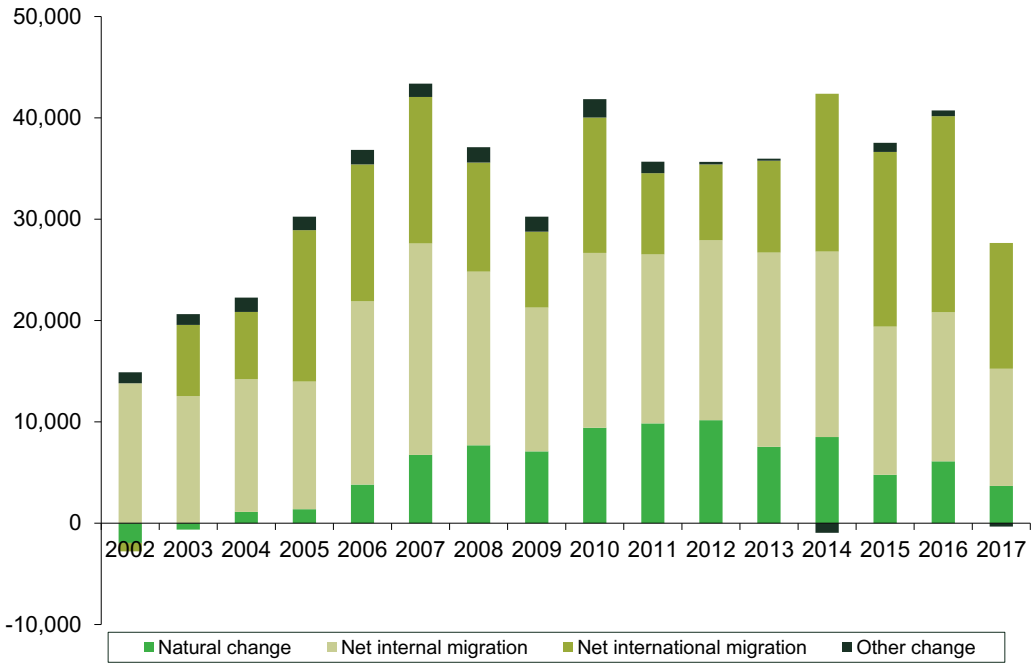
Figure A4.41 Year-on-year population growth



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.124 These fluctuations in population growth rates in the Five Authorities area appear to have been driven by a combination of internal and international migration, as shown in Figure A4.42. Internal migration was the largest contributor to population growth in the Five Authorities area between 2006 and 2014 with international migration becoming a larger contributor in more recent years.

Figure A4.42 Components of population change, Five Authorities



Note: Natural change is the difference between the number of live births and deaths during each year. Internal migration is defined as residential moves between different LADs in the UK,

including those that cross the boundaries between the four UK nations: England, Wales, Scotland and Northern Ireland. International migration is defined as residential moves to a country other than that of the person's usual residence. Other changes comprise changes to the size of armed forces stationed in the UK and other special population adjustments.

Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

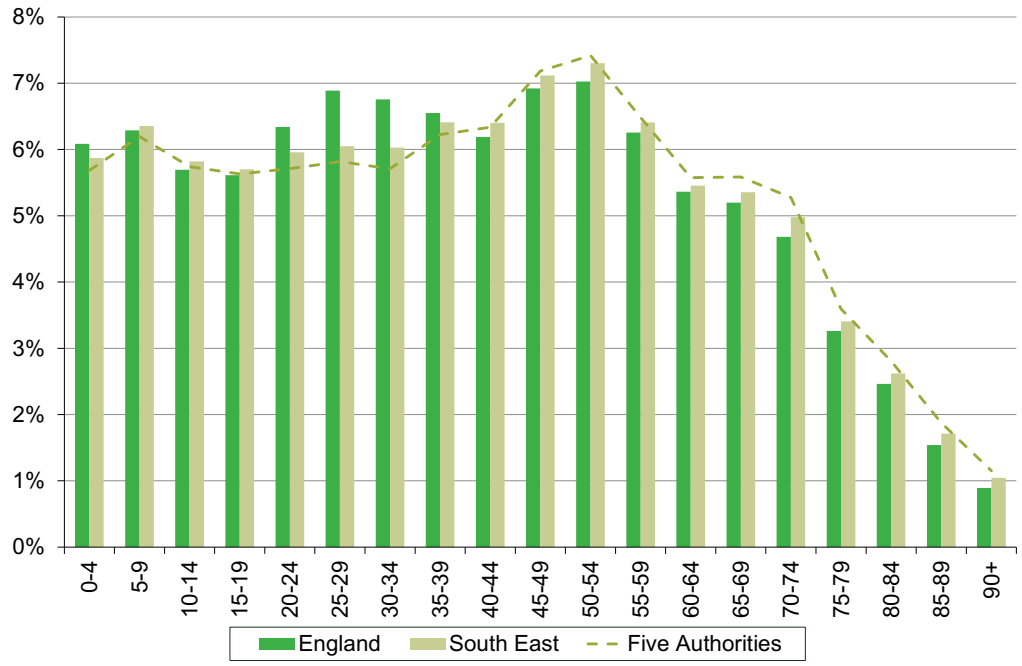
A4.125 According to ONS projections, the population of the Five Authorities area will continue to grow, but at a slower rate, with a predicted growth of 14.8% by 2041.[295] This is above the forecast 12.6% population growth in the South East and 11.4% in England. The population growth is forecast to be primarily driven by internal migration.

Distribution of ages

A4.126 The working age is defined as people between the ages of 16 and 64 (inclusive).[296] On this basis, the working age population of the Five Authorities area is marginally below the national and regional averages. 61.0% of the population is of working age compared with 62.8% of the national population, and 61.8% of the South East's population (see Figure A4.43 below).

A4.127 This figure is driven by a lower share of people between the ages of 20 and 39, as shown in Figure A4.43.

Figure A4.43 Population by age

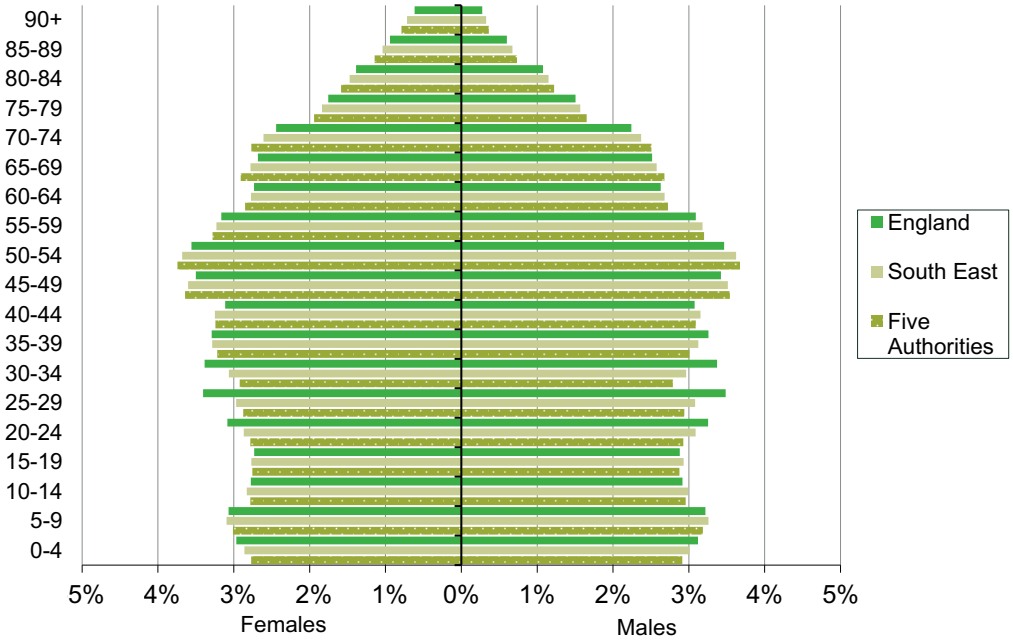


Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

A4.128 Data on population by gender suggests that the differences in age profile between the Five Authorities area and the South East and England is not gender-specific. For instance, in the 30–34 age group, the area has a smaller share of both males and females.

[295] Office for National Statistics (2019), 'Population projections incorporating births, deaths and migration for regions and local authorities: Table 5', 9 April.
[296] NOMIS (2010), 'Working age', 11 August, https://www.nomisweb.co.uk/articles/487.aspx, accessed 25 April 2019.

Figure A4.44 Population pyramid



Source: Office for National Statistics (2018), 'Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland', 28 June.

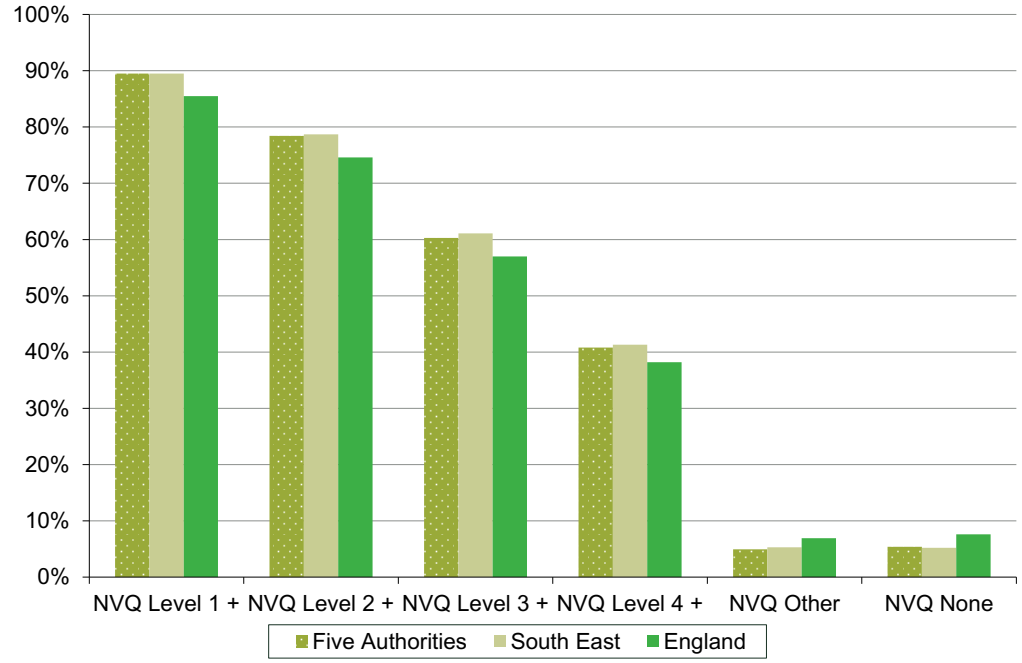
A4D.2 Education

A4.129 We now turn to educational attainment and the availability of higher education in the Five Authorities area.

Qualifications

A4.130 On average, the population of the Five Authorities area is educated to a higher level than the national average; however, it is slightly below the regional average. As shown in Figure A4.45, almost 90% of the working age population in the area has at least an NVQ Level 1 qualification, and approximately 40% has Level 4 or above. The education level within the LADs in the Five Authorities area varies significantly. For example, almost 65% of the population of Woking has an NVQ Level 4 or above, compared with just 23% of the population of Swale, and approximately 25% of the populations of Thanet, Ashford and Arun.

Figure A4.45 Qualification level of the working age population, as in 2017



Note: NVQ Level 1 is GCSE (grades D–G) or equivalent; NVQ Level 2 is GCSE (grades A*–C) or equivalent; NVQ Level 3 is AS and A Level or equivalent; NVQ Level 4 includes any certificate of higher education.

Source: NOMIS (2019), 'Annual population survey', 22 January.

Higher education

A4.131 The Five Authorities area contains seven universities (University of Sussex; University of Brighton; University for the Creative Arts, Epsom; University of Surrey; Royal Holloway; University of Chichester; University of Kent). In 2017:

- 95.3% of undergraduate leavers from the University of Sussex were in employment or further study within six months of graduating;[297]
- 92.6% of undergraduate leavers from the University of Brighton were in employment or further study within six months of graduating;[298]
- 96.9% of undergraduate leavers from the University for the Creative Arts were in employment or further study within six months of graduating;[299]
- 94.2% of undergraduate leavers from the University of Surrey were in employment or further study within six months of graduating;[300]
- 92.5% of undergraduate leavers from Royal Holloway were in employment or further study within six months of graduating;[301]
- 93.7% of undergraduate leavers from the University of Chichester were in employment or further study within six months of graduating;[302]

[297] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[298] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[299] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[300] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[301] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[302] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.

- 95.1% of undergraduate leavers from the University of Kent were in employment or further study within six months of graduating;[303]

A4.132 Four of these seven universities are above the national average graduate employment rate of 94.4%.[304]

A4.133 While there are several universities in the area, the supply of places appears less abundant when put into context of potential students in the area. There are a significantly below-average number of university places per 16- to 18-year-old in the Five Authorities area: 0.26 places versus 0.55 across England. This could:

- reduce the number of young people who want or are able to stay in the Five Authorities area;
- reduce the number of young people who are attracted to the area.

A4.134 These factors could be contributing to the lower share of the population in their 20s in the Five Authorities area than the rest of England. This is supported by a study conducted by the ONS in 2015, which revealed that the majority of internal migration occurs between the ages of 18 and 30, when people are moving for study and career opportunities.[305]

A4D.3 Labour market

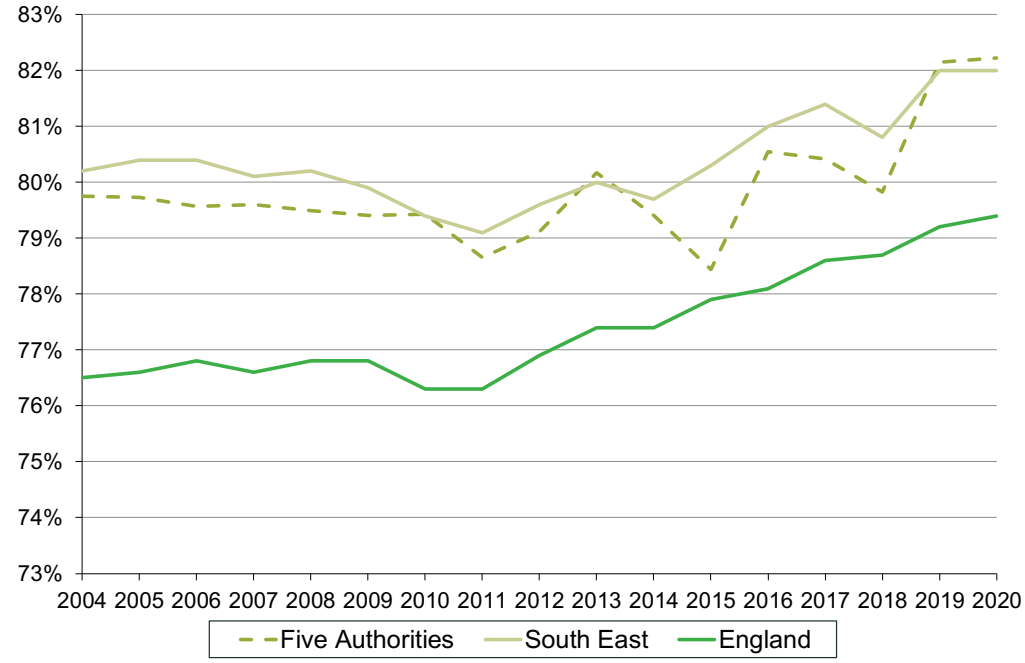
A4.135 This section examines the composition of the labour market looking at trends in employment and unemployment over time and within sectors and occupations.

Economic activity

A4.136 Economic activity in the Five Authorities area is higher than in England, but below the South East, with 82% of the working age population economically active in 2019. This has been roughly constant since 2004, although the trend exhibits a significant amount of fluctuation between 2011 and 2017, which is not seen in the wider geographic areas (see Figure A4.46). 13 of the LADs in the Five Authorities area are less economically active than the South East average. Canterbury and Thanet have particularly low economic activity rates, at just 71% and 74%, respectively. In contrast, Adur and Dartford both have economic activity rates of over 88.5%.

[303] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[304] HESA (2018), 'Employment of leavers: UK Performance Indicators', 5 July.
[305] Office for National Statistics (2016), 'Internal migration, England and Wales: Year Ending June 2015', 23 June.

Figure A4.46 Economic activity over time



Note: Data available from 2004 only. Data for 2020 refers to the economically active population between October 2019 and September 2020, which is the latest period for which data was available. Share of economically active population is weighted by the active population in each of the LADs in the study areas.

Source: NOMIS (2021), 'Annual population survey', January.

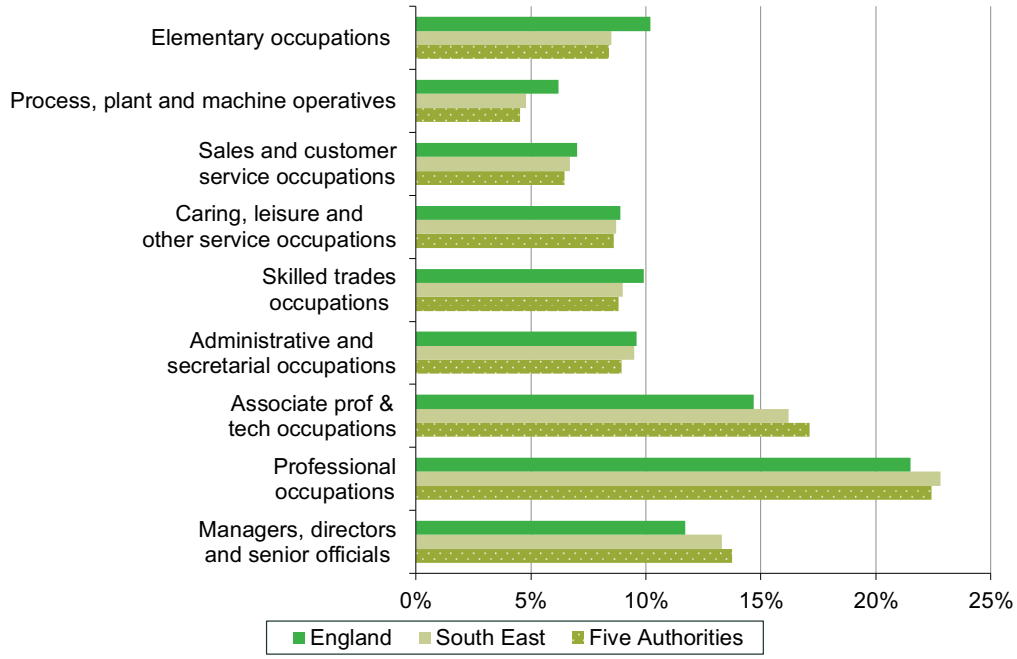
Employment

A4.137 It is possible to use ONS data to examine employment patterns in more detail. Again, we use the South East and England as benchmarks for comparison. The data suggests that employment in the Five Authorities area is predominantly in professional occupations, associate/technical occupations and managerial functions, with 53% of employees drawn from these three occupational groups.

A4.138 The share of employment is largest in these industries for the Five Authorities and the national and regional comparators; however, England has a smaller share of employment than the South East and the Five Authorities, which are closely aligned.

A4.139 ONS data suggests that managerial and associate occupations—two occupation groups for which the Five Authorities area has a larger share of employment than England, and a similar share of employment to the South East—have a higher age profile of employees, with high proportions above the age of 45. This is consistent with the age profile of the population in the Five Authorities area and the South East as well as the higher level of education and training that we might expect to see in these occupations.

Figure A4.47 Employment by occupation

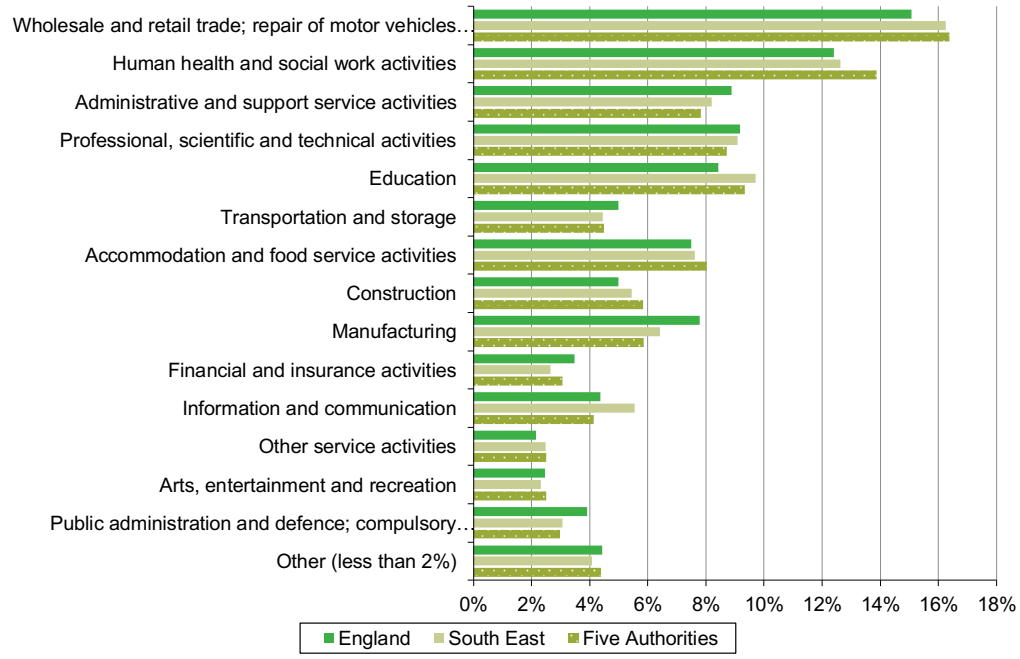


Note: Estimates of population in employment in each LAD are used as weights in each occupation and study area.

Source: NOMIS (2021), 'Annual population survey', January

A4.140 We can also see from the data that a large proportion of employment in the Five Authorities is in service industries, consistent with the regional and national comparators (see Figure A4.48 below). The share of employment in wholesale and retail trade, human health and social work activities, and construction is larger in the Five Authorities area than in England. Conversely, the Five Authorities area has a smaller share of employment in the manufacturing, and professional, scientific and technical activities than the South East and England. The information and communication industry is smaller in the Five Authorities than the South East; however, it is in line with the size of the industry nationally.

Figure A4.48 Employment by industry



Note: Employment for calendar year 2019.

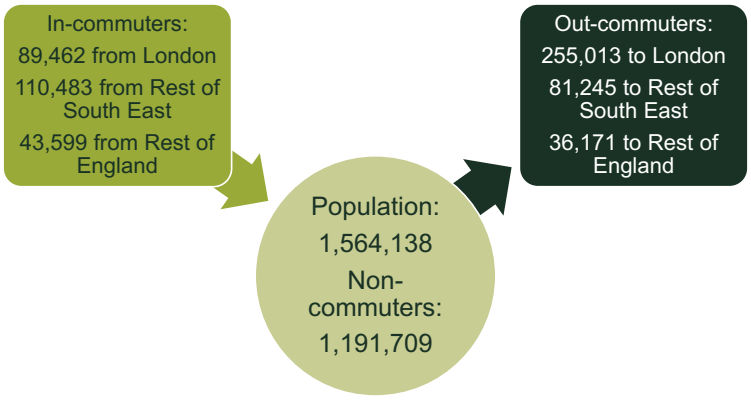
Source: NOMIS (2021), 'Business Register and Employment Survey: open access'.

Commuting patterns

A4.141 Data on commuting patterns is only available from the 2011 Census of Population; therefore, in this section we use the most recent data available.

A4.142 In 2011, there was a net commuter flow out of the Five Authorities area. The majority of the area's population (77.5%) were working within the Five Authorities area, but out-commuters exceeded in-commuters by almost 130,000 people.[306] The majority of commuters were either commuting in from, or out to, London.

Figure A4.49 Commuting patterns, 2011



Note: The population only includes working age residents who were in employment at the time of surveying.

Source: Office for National Statistics (2011), 'Census of population, 2011'.

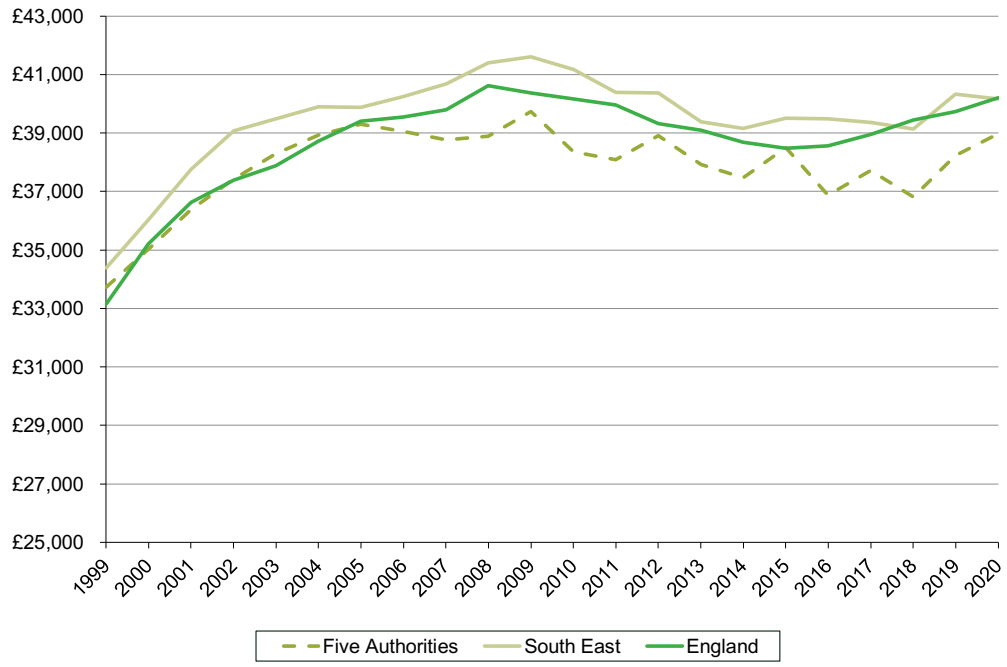
[306] This only considers the population of working age residents in the Five Authorities who were in employment at the time of surveying.

Earnings

A4.143 Residents of the Five Authorities area tend to have above-average earnings compared with England as a whole, whereas employees working in the Five Authorities area tend to have below-average earnings.

A4.144 Workplace-based earnings within the Five Authorities area have been persistently lower than the South East and England though the gap itself has fluctuated over time (see Figure A4.50). In 2019, workplace-based earnings were, on average, £1,500 pear year below the national average.

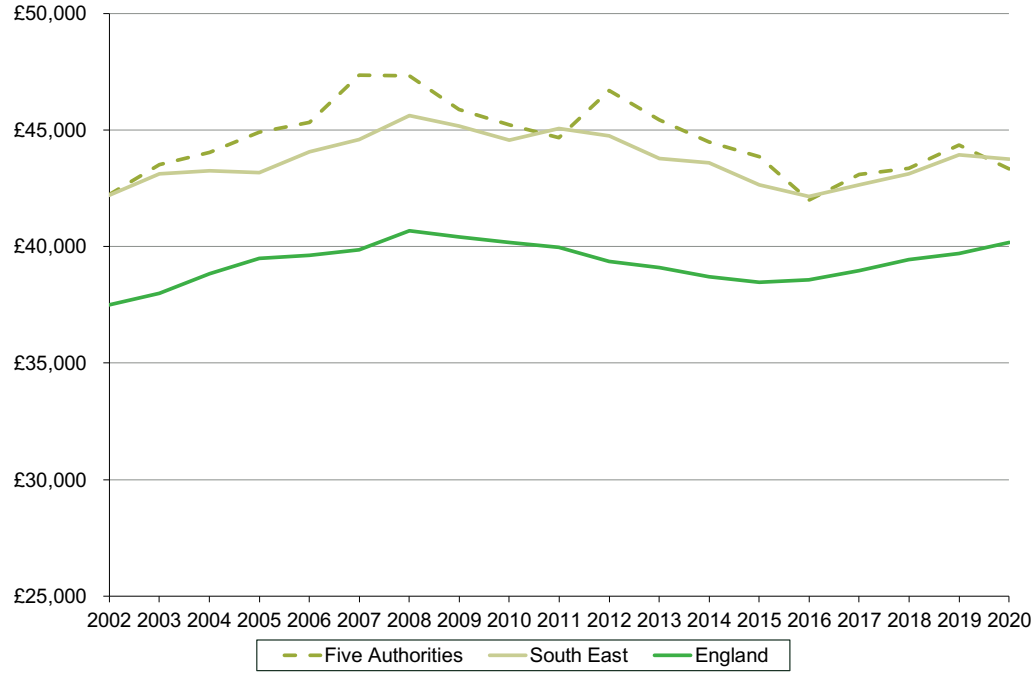
Figure A4.50 Mean annual full-time earnings (real 2021), workplace-based



Source: NOMIS (2021), 'Annual survey of hours and earnings – workplace analysis'.

A4.145 Conversely, earnings of residents have consistently been higher in the Five Authorities area than in England as a whole, and they have been in line with earnings across the South East. In 2019, residence-based earnings were, on average, £4,600 per year above the national average.

Figure A4.51 Mean annual full-time earnings (real 2021), residence-based



Source: NOMIS (2021), 'Annual survey of hours and earnings – resident analysis'.

A4.146 The disparity between workplace-based and residence-based earnings could be explained by some of the characteristics of the working age population as well as the structure of the local economy. Below, we explore these factors in turn.

Location of employment

A4.147 There is significant out-commuting from the area to London, which could explain the low workplace earnings but high resident earnings as people may be travelling further for higher earnings in industries paying above-average wages.

Education level

A4.148 Educational attainment is positively correlated with income. Therefore, the higher-than-average education level of residents of the Five Authorities area is also likely to contribute to higher resident earnings.

Age of employees

A4.149 ONS analysis suggests that average hourly wages are positively correlated with age until the age of 50. On average, wages peak between the ages of 35 and 50.[307] This could explain, to some extent, the earnings gap between the Gatwick Diamond and the regional and national comparators, as there is a larger-than-average proportion of the population between the ages of 40 and 50 in the Five Authorities area.

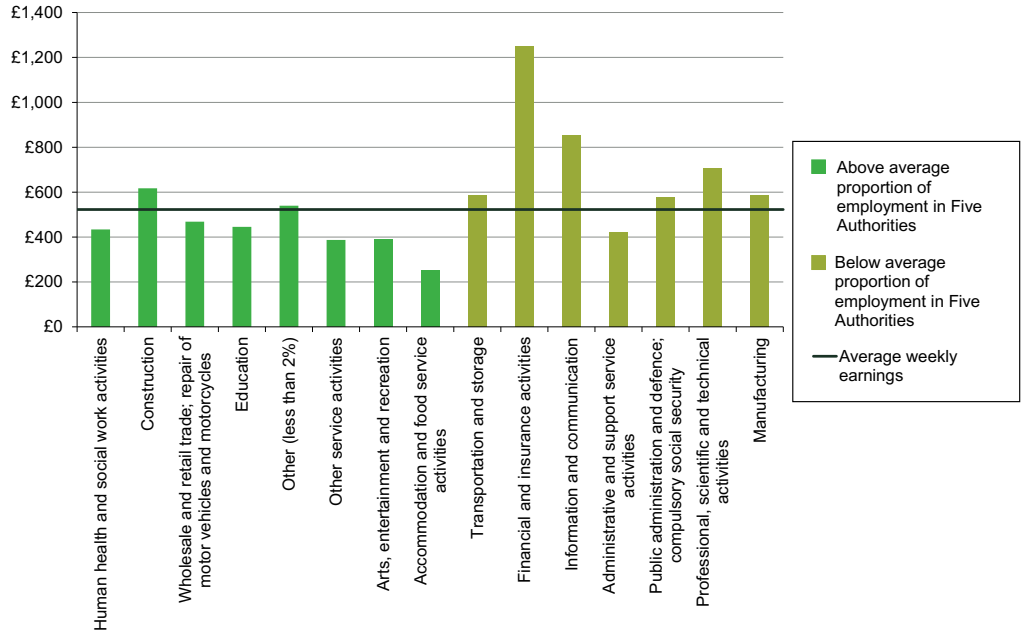
Industrial mix of workplace employment

A4.150 The industrial composition of the Five Authorities economy appears to be one of the drivers for the wage disparity with the average for England. The industries within the Five Authorities area that have a higher-than-average

[307] Office for National Statistics (2018), 'Public and private sector earnings in the UK: 2017', 2 November.

proportion of employment also tend to have lower-than-average wages or close-to-average wages. For example, average weekly earnings in the human health and social work activities industry are almost £100 below the average across all industries. The wholesale and retail trade, and accommodation and food service activities industries also have below-average weekly earnings, as shown in Figure A4.52. The industries in which average weekly earnings are below average comprise 61.3% of total employment, compared with 59.1% in the South East and 57.7% in England. The lower-than-average earning level of the prominent industries in the Five Authorities area is reflected in average annual wages, which have been lower than in the South East or England since 2004.

Figure A4.52 Average weekly earnings by industry



Note: Price base year is 2018. Average weekly earnings are calculated as the average earnings in the UK in each industry weighted by the proportion of total employment in the Five Authorities area. The proportion of employment is compared against the national average.

Source: Office for National Statistics (2019), 'Average weekly earnings by industry (Monthly Wages and Salaries Survey)', 19 March.

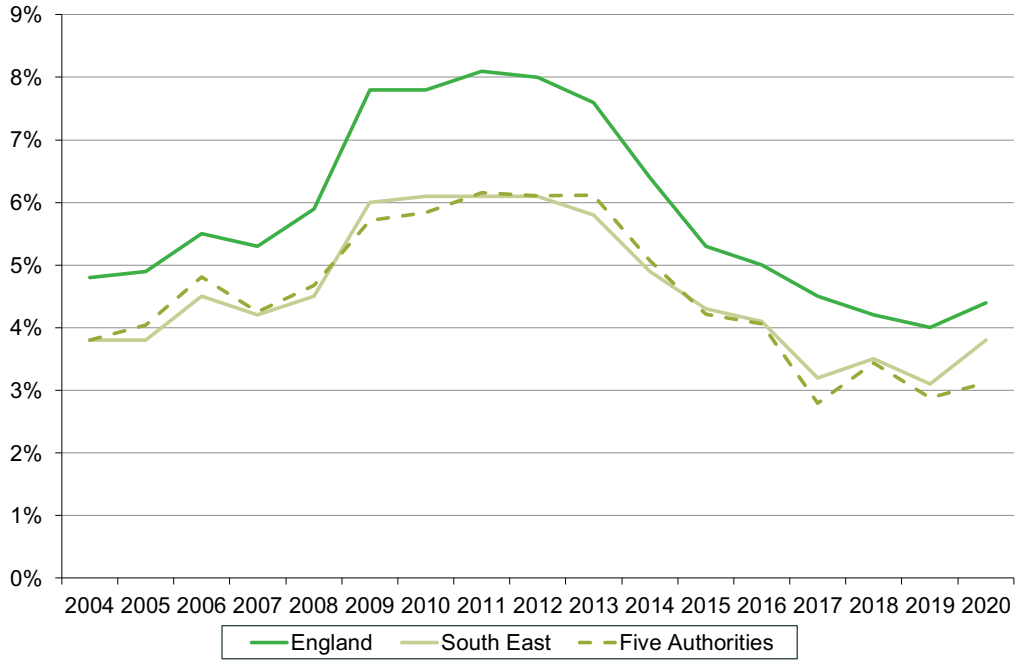
Unemployment

A4.151 There are two ways to measure unemployment: the Claimant Count (total number of people eligible to claim the Jobseeker's Allowance) and the LFS (total number of people without any kind of job, who have looked for work in the last month and are available to start work immediately).

A4.152 LFS data is not available at the local authority level so we have used APS data, which combines data from two waves of the LFS with the continuous household survey data collected in the APS.

A4.153 The unemployment rate in the Five Authorities area rose to 5.7% in 2009 but has since fallen to 2.9% in 2019 (3.1% in 2020). On average, it has been 1–2 percentage points lower than in England since 2004. Figure A4.53 shows how unemployment has changed over time. The trend in unemployment in the Five Authorities area has followed the South East and England as a whole. However, the overall rate has tracked closer to the wider South East and been consistently lower than England.

Figure A4.53 Unemployment over time

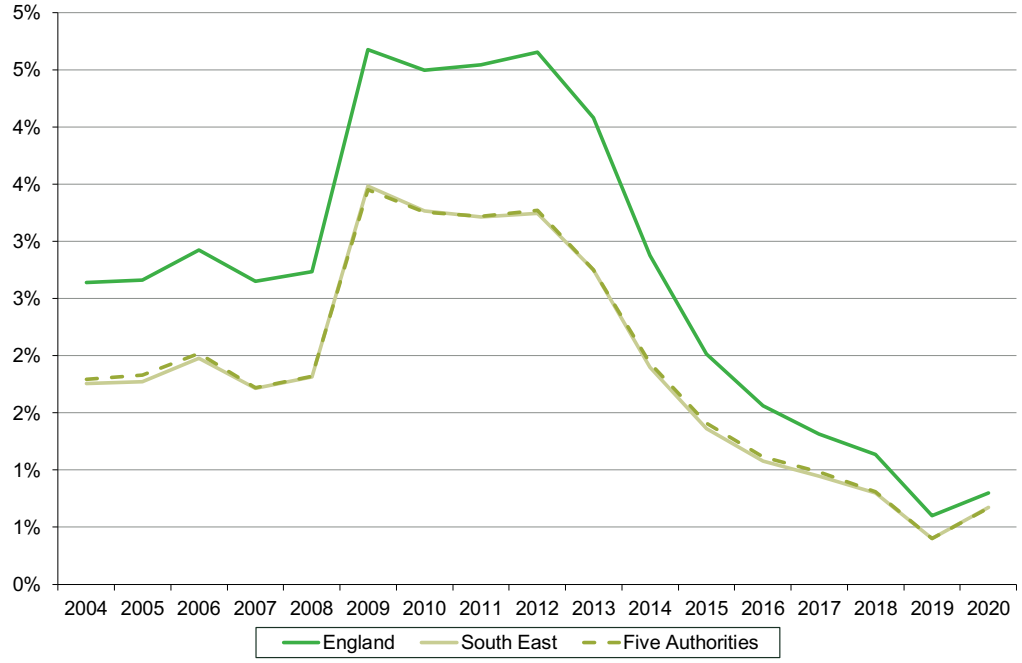


Note: Unemployment rate calculated as a proportion of the economically active population who are unemployed from January to December with the exception of 2020 where data from October 2019 to September 2020 was used.

Source: NOMIS (2021), 'Annual population survey', January.

A4.154 The Five Authorities area has had a consistently lower claimant count than England and has consistently mirrored the South East, as shown in Figure A4.54. The claimant count has moved with a similar trend to unemployment over the period.

Figure A4.54 Claimant count



Note: Claimant count calculated as the average proportion of the economically active population claiming Jobseeker's Allowance between January and December with the exception of 2020 where data from October 2019 to September 2020 was used.

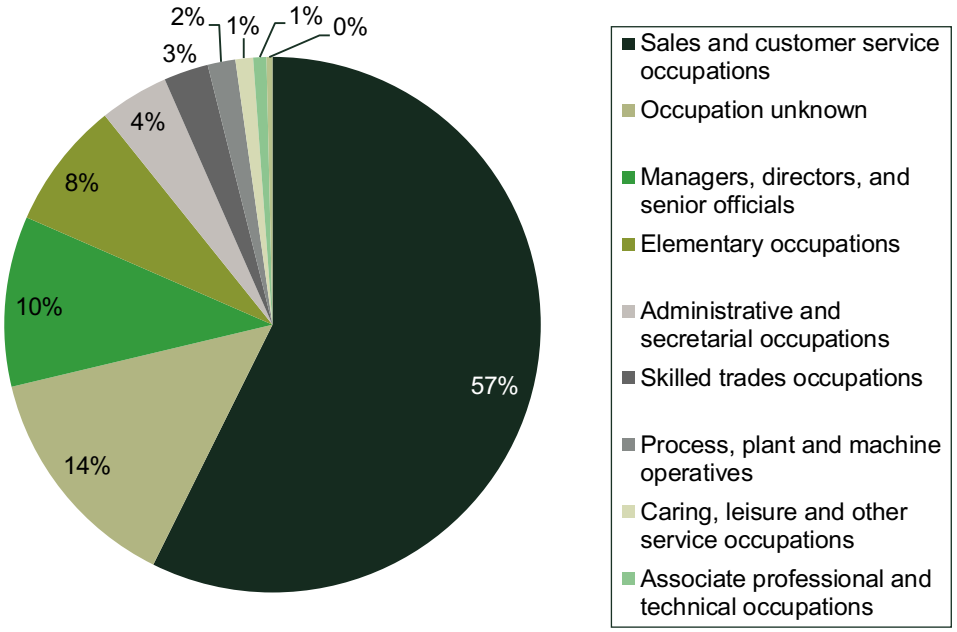
Source: NOMIS (2021), 'Jobseeker's Allowance with rates and proportions', March.

A4.155 The data suggests that periods of unemployment in the Five Authorities area are also relatively short. On average, the claim period in the Five Authorities area is shorter than in the South East or England, with 5.7% claiming for less than one month in the Five Authorities area, compared with 4.1% in England, and 73.0% claiming for longer than six months, compared with 79.6% in England.

A4.156 As shown in Figure A4.55, sales and customer service occupations, such as retail and telephone sales, are the most highly sought-after occupations in the Five Authorities area, with 57% of claimants seeking these occupations. Sales occupations comprise just 6% of employment in the area, and a similarly low proportion in the South East and England. This indicates an excess supply, and, consequently, high levels of unemployment for sales occupations in the Five Authorities area but also throughout the country. It may also indicate a higher churn rate in sales and customer service occupations than in other occupations.

A4.157 Conversely, professional occupations make up the largest proportion of employment but the smallest proportion of unemployment, indicating low rates of unemployment in professional occupations. Associate professional and technical occupations also comprise a significant proportion of employment in the Five Authorities area, and a lesser proportion of unemployment. These trends are consistent with the South East and England, suggesting that this is a sector-wide pattern.

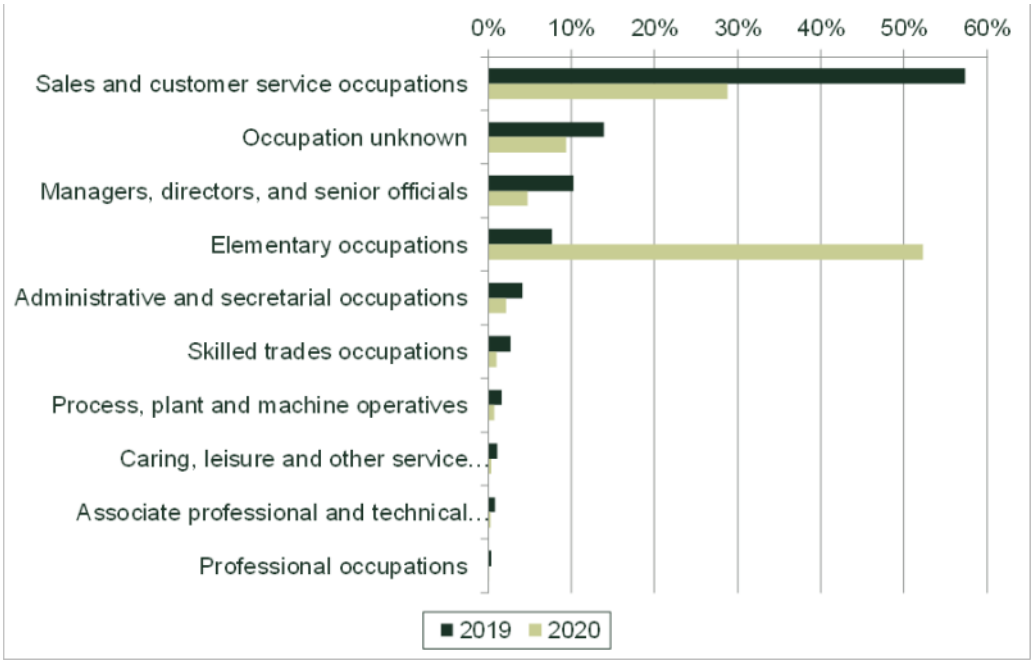
Figure A4.55 Jobseeker's Allowance by occupation sought in the Five Authorities area, as in 2019



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.158 Figure A4.56 below shows the difference between 2019 and 2020 data in jobseeker's allowance by occupation sought. As can be seen in the chart, a shift happened in the most sought-after occupations from 'sales and customer service occupations' to 'elementary occupations'. This shift translates the effect of pandemic-induced restrictions on the ability of certain sections of employment to work. While 'sales and customer service occupations' were able to continue working remotely, a number of people in the 'elementary' occupations' might not have been able to and were likely not directly concerned by the furlough scheme because of temporary work contracts (e.g. in the food sector).

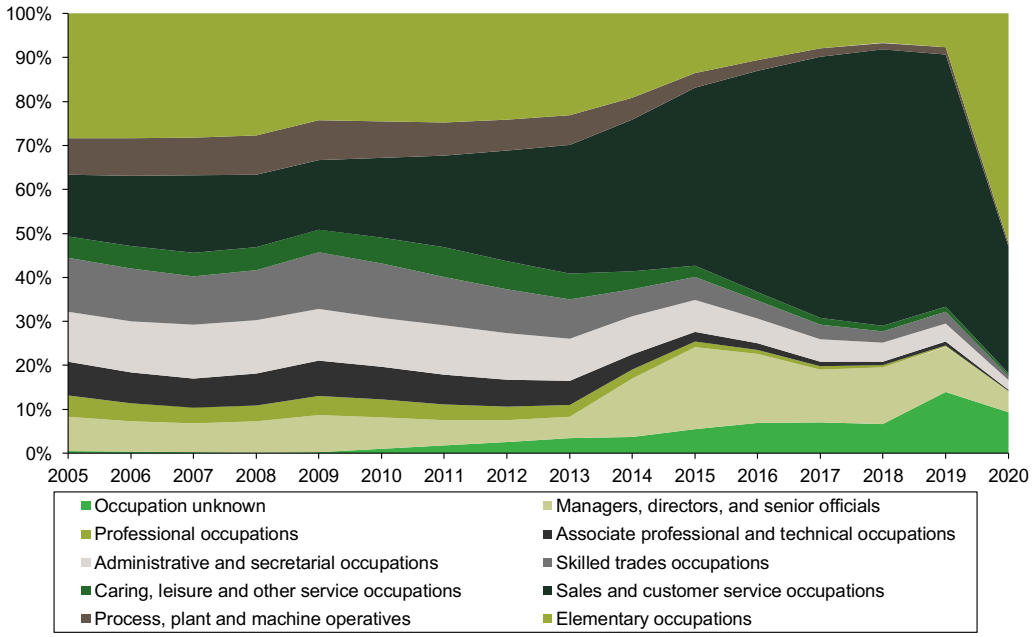
Figure A4.56 Jobseeker's Allowance by occupation sought in the Five Authorities area, as in 2019 and 2020



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4.159 Historically, elementary occupations were the most highly sought-after jobs; however, since 2012, the proportion of claimants seeking sales jobs has risen rapidly. This trend can be seen in Figure A4.57.

Figure A4.57 Jobseeker's Allowance by occupation sought



Source: NOMIS (2021), 'Jobseeker's Allowance'.

A4D.4 Economy

A4.160 This section examines the composition of the business population in the Five Authorities area relative to the regional and national comparators.

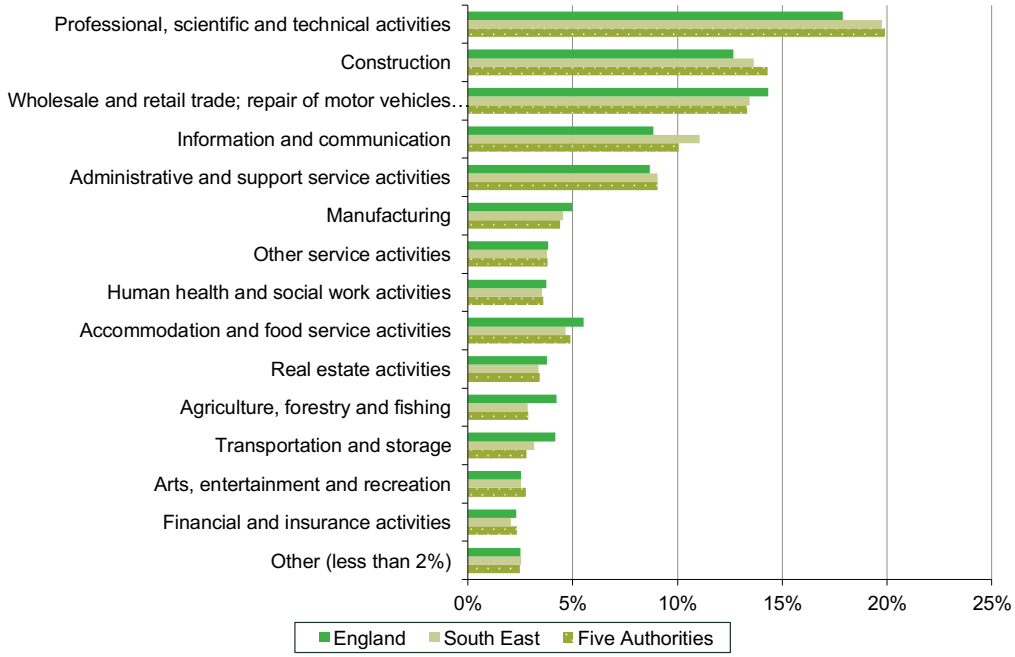
Enterprise

A4.161 The professional, scientific and technical activities industry has consistently been the largest industry in the Five Authorities area since 2010; however, it became the largest industry nationally only in 2013. Prior to this, wholesale and retail trade was the largest industry, and is still the largest employer in all three areas.

A4.162 There are approximately 199,000 enterprises in the Five Authorities.[308] This has been increasing steadily over time, in line with the South East and England. Compared with the regional and national comparators, a slightly larger proportion of enterprises in the Five Authorities area are SMEs, and fall into the £100,000–£499,000 turnover band. However, a below-average proportion of enterprises fall into the turnover bands of £500,000 and above.

A4.163 The Five Authorities area has an above-average proportion of enterprises in the construction industry, which is consistent with the above-average proportion of employment in this industry. Conversely, the Five Authorities area has below-average proportions of employment in the professional, scientific and technical activities, and information and communication industries, but above-average proportions of enterprises within these industries. This suggests a prevalence of smaller businesses employing a small number of people in these industries.

Figure A4.58 Enterprises by industry, as in 2019



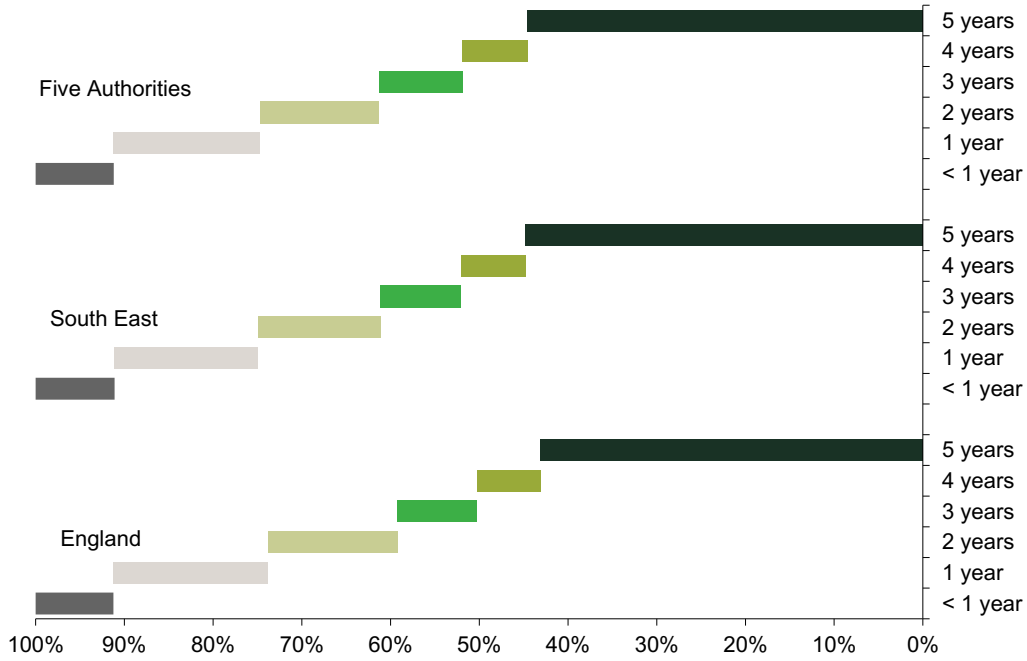
Note: This is representative of the number of businesses in each industry and is not indicative of revenues in each industry.

Source: NOMIS (2021), 'UK Business Counts', March.

A4.164 Businesses in the Five Authorities area also have a slightly higher survival rate than the national average. Figure A4.59 shows the survival rate of new businesses launched in 2012. More businesses survive longer than two years in the Five Authorities area: 61.3% versus 59.2% across England.

[308] NOMIS (2018), 'UK Business Counts', 10 March.

Figure A4.59 Business survival rate (launched in 2012)



Source: Office for National Statistics (2018), 'Business demography, UK', 21 November.

Deprivation

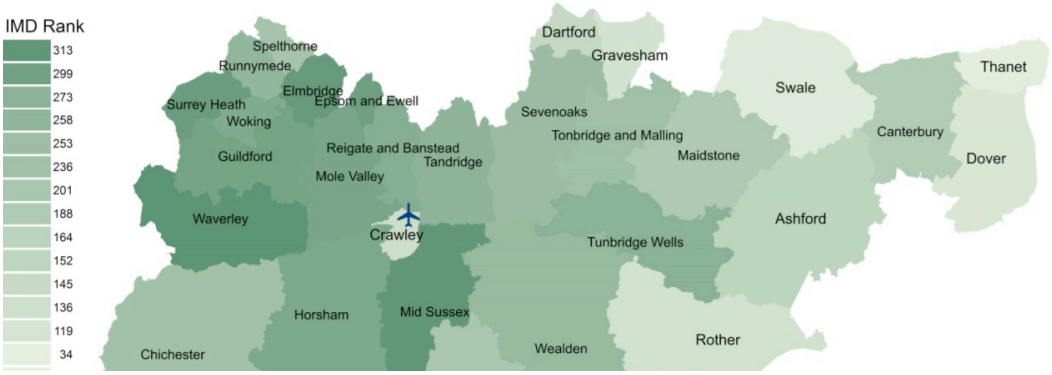
A4.165 This section examines the level of deprivation in the Five Authorities area relative to the regional and national comparators.

Deprivation indices

A4.166 The IMD provides a set of relative measures of deprivation by area. It is calculated using seven domains of deprivation (Income Deprivation; Employment Deprivation; Education, Skills and Training Deprivation; Health Deprivation and Disability; Crime; Barriers to Housing and Services; Living Environment Deprivation). There are two supplementary indices (the Income Deprivation Affecting Children Index and the Income Deprivation Affecting Older People Index) in addition to the IMD and the seven domains.

A4.167 There is significant variation in the level of deprivation across the Five Authorities area; however, the areas immediately surrounding Gatwick Airport, excluding Crawley, perform better in the IMD. This is also the case for employment, education and health deprivation. Conversely, most LADs perform worse in the barriers to housing and services than in other domains. Figure A4.60 shows the distribution of deprivation across the Five Authorities.

Figure A4.60 Index of Multiple Deprivation



Note: The IMD rank is the rank of the average rank within the LAD. There are 326 LADs in England; 1 is the most deprived and 326 is the least deprived.

Source: Ministry of Housing, Communities & Local Government (2015), 'English Indices of Deprivation 2015', 30 September.

Contextualisation of observed high barriers to housing and services in the Five Authorities area

A4.168 We see from Figure A4.60 that the LADs in the Five Authorities area have relatively high scores on the Barriers to Housing and Services Deprivation index. This poor performance can be explained by the combination of that index's construction and the special conditions of the housing market in the South East of England, within which the Gatwick Diamond lies.

A4.169 The Barriers to Housing and Services Index measures the physical and financial accessibility of housing and local services via two 'sub-domains': geographical barriers and wider barriers.[309] The 'geographical barriers' subdomain relates to the physical proximity of local services, namely post offices, primary schools, general stores, supermarkets and GP surgeries. Proximity to these services is measured by road distance.[310] The 'wider barriers' sub-domain is composed of three indicators:[311]

- **Household overcrowding**—i.e. the proportion of all households judged to have insufficient space to meet the household's needs;
- **Homelessness**—i.e. LAD-level rate of acceptances for housing assistance;
- **Housing affordability**—i.e. the ability to enter owner-occupation or the private rental market without assistance from Housing Benefit.

A4.170 The relevant indicators within the two sub-domains are standardised by ranking, transformed to a Normal distribution and then combined using equal weights. In turn, the sub-domains are combined using the same transformation

[309] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[310] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.
[311] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 50.

to create the overall Barriers to Housing and Services domain score.[312] The result of this construction is that the 'housing affordability' indicator has an important weight in determining a LAD's performance with respect to housing and services deprivation. The housing affordability indicator itself compares house prices and rents to the income of each household's primary earner, excluding income from means-tested benefits.[313]

A4.171 The end result is that, when the particularly high house prices in the South East of England (30% higher by average price paid than in England as a whole)[314] are combined with the construction of the housing affordability indicator and that indicator's weight within the 'Barriers to Housing and Services' domain, LADs in the South East, such as those in the Gatwick Diamond, perform particularly poorly on the Barriers to Housing and Services index.

[312] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 53.
[313] Ministry of Housing, Communities and Local Government (2019), 'The English Indices of Deprivation 2019: Technical Report', September, p. 55.
[314] Office for National Statistics (2019), 'Median house prices for administrative geographies: HPSSA dataset 9', March.

A5 Footprint employment disaggregated by local authority district

A5.1 To inform Lichfields' analysis as part of the socioeconomics chapter of the PEIR, Oxera produced disaggregated estimates for employment footprint for each LAD within the Five Authorities area (the wider local study area).

A5.2 Table A5.1 summarises the total footprint estimates generated by the Project by LAD in each scheme year.

Table A5.1 Total incremental footprint of the Project by LAD

	2029	2032	2038	2047
Epsom and Ewell	<100	100	100	100
Mole Valley	100	200	200	200
Reigate and Banstead	200	500	500	500
Tandridge	100	200	200	200
Crawley	1,300	4,000	3,800	3,600
Mid Sussex	800	2,400	2,300	2,100
Horsham	800	2,400	2,300	2,100
Total Gatwick Diamond	**3,200**	**9,800**	**9,400**	**8,700**
Brighton and Hove	100	400	400	300
Lewes	<100	100	100	100
Croydon	100	400	400	400
Worthing	500	1,500	1,400	1,300
Arun	500	1,500	1,400	1,300
Chichester	600	1,800	1,700	1,500
Adur	200	700	700	600
Total Coast to Capital LEP	**5,200**	**16,000**	**15,300**	**14,300**
Spelthorne	<100	100	100	100
Runnymede	<100	100	100	100
Surrey Heath	<100	100	100	100
Woking	<100	100	100	100
Elmbridge	<100	200	200	200
Guildford	100	200	200	200
Waverley	<100	100	100	100
Hastings	<100	100	100	100
Rother	<100	100	100	100
Wealden	<100	100	200	100
Eastbourne	<100	100	100	100
Sevenoaks	<100	100	100	100
Dartford	<100	100	100	100
Gravesham	<100	100	100	100
Tonbridge and Malling	<100	100	100	100
Maidstone	<100	100	100	100
Tunbridge Wells	<100	100	100	100
Swale	<100	100	100	100
Ashford	<100	100	100	100
Canterbury	<100	100	100	100
Shepway	<100	100	100	100
Thanet	<100	100	100	100
Dover	<100	100	100	100
Total Five Authorities	**5,900**	**18,100**	**17,500**	**16,400**

Note: Employment estimates by LAD are disaggregated as described in subsection 5C of the report. Total footprint estimates in the table correspond to the estimated additional jobs (direct, indirect and catalytic) generated by the Project in each LAD. Values may not sum due to rounding.

Source: Oxera.

A6 LAD employment disaggregation

A6A Direct employment disaggregation

A6.1 Below, we disaggregate the local employment footprint estimates (direct, indirect and catalytic) by local authority to inform Lichfields' analysis as part of the PEIR socioeconomics chapter.

A6.2 We received data on the commuting patterns of employees on site based on Passholder data from GAL. This dataset corresponds to a geographic breakdown by LAD of the reported residence of employees holding passes providing access to airport facilities (i.e. GAL and non-GAL on-site employees). With this data, we break down forecast direct employee numbers by occupational category into a residence-based geographic distribution.

A6.3 We use this information on the location and occupation of on-site employees at the airport to distribute to each LAD the additional on-site jobs generated as a result of the Project (forecasts by occupational category from ICF), assuming the same geographical distribution of employees from the survey in the future. Table A6.1 shows the results of this exercise, aggregated across our three study areas.

Table A6.1 Direct employment breakdown by study area

	2029	2032	2038	2047
Direct employment	**1000**	**3,100**	**3,200**	**3,100**
of which Gatwick Diamond	500	1,700	1,700	1,600
of which Coast to Capital	700	2,200	2,200	2,100
of which Five Authorities	700	2,300	2,400	2,300

Note: Employment estimates denote the number of employees on site at Gatwick Airport who reside within the boundaries of each given study area.

Source: Oxera analysis.

A6B Indirect employment disaggregation

A6.4 Similar to direct employment, we conduct analysis to disaggregate indirect employment estimates into employment figures at a LAD level.

A6.5 Unlike the direct economic footprint (which, by definition, is all contained on site at Gatwick Airport in the Gatwick Diamond), the indirect footprint could be spread across a wide geographic area. In order to estimate indirect employment figures at a LAD level, it is necessary to form a view of how much indirect activity would be retained locally. To do this, we use two pieces of evidence:

- the Oxford Economics report entitled 'The Economic impact of Gatwick Airport', which presents a disaggregation of Gatwick Airport's indirect GVA[315] into a share corresponding to the Gatwick Diamond (24%), a share for the Coast to Capital LEP (14%), and a share for the rest of the UK. This evidence is used to constrain indirect employment estimates at a study area level (Gatwick Diamond, Coast to Capital LEP, and Five Authorities area);

[315] Oxford Economics (2017), 'The Economic impact of Gatwick Airport', p. 13.

- ONS data on GVA per LAD by sector,[316] to calculate the share of GVA by sector in local authorities within each study area. These shares, combined with our estimates of indirect GVA by sector for each study area (as described in Table 5.3 above), yielded indirect GVA by LAD.

A6.6 This analysis provides estimates by local authority of supply-chain (indirect) employment on a workplace basis in the wider study area.

A6C Catalytic employment disaggregation

A6.7 Similar to indirect employment disaggregation, we conduct an analysis to disaggregate catalytic employment estimates into employment figures at a LAD level and on a workplace basis.

A6.8 We use ONS data on GVA per LAD[317] to calculate the share of GVA for each local authority in the Five Authorities area. These shares, combined with our estimates of catalytic GVA by sector for each study area (as described in Table 5.3 above), yield catalytic GVA by LAD.

[316] Office for National Statistics (2019), 'Regional Gross Value Added (Income Approach) by Local Authority in the UK'.
[317] Office for National Statistics (2019), 'Regional Gross Value Added (Income Approach) by Local Authority in the UK'.

A7 Sensitivity analysis

A7.1 In the main body of this report, we present results of analysis based on ICF's traffic forecast as described in section 3C.

A7.2 In this appendix, we provide estimates of the economic activity of the Project for a sensitivity around this forecast which assumes slower growth in traffic in the London airport system: more specifically where the passenger volumes that ICF forecast will be achieved in 2047 are in fact achieved five years later in 2052. This sensitivity aims to illustrate the effect of lower traffic growth on the assessed economic impacts of the Project. This sensitivity is deliberately stylised and clearly other scenarios could be envisaged but this sensitivity illustrates that despite the lower passenger volume, the Project is still expected to generate considerable economic impacts; in the long run, there will not be significant differences in the economic benefits created by the Project between the main and sensitivity scenarios.

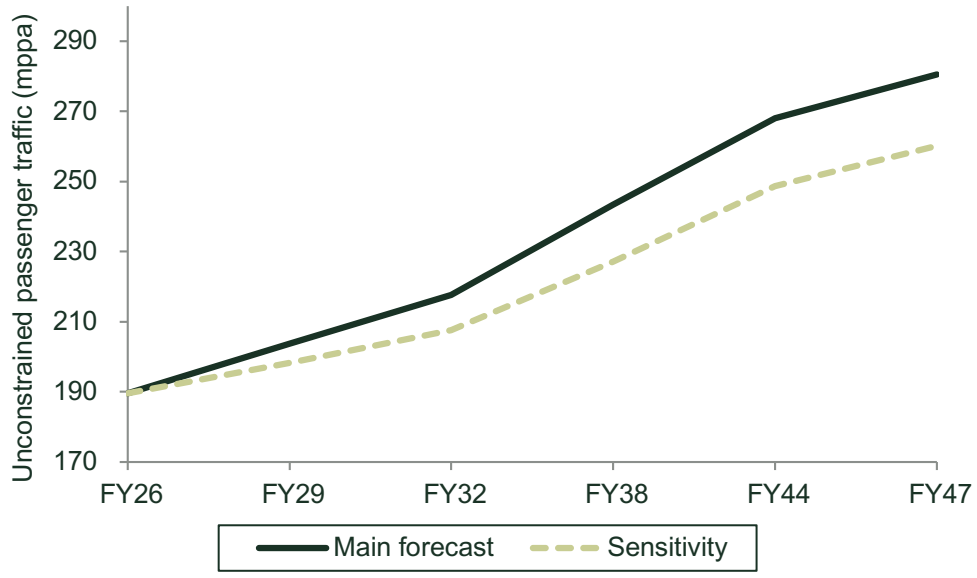
A7.3 The next section sets out the methodology used to produce these traffic forecasts.

A7A Sensitivity traffic forecasts

A7.4 We have estimated alternative traffic forecasts for the whole London airport system with a slower growth in traffic in each year compared to ICF's forecasts. This reduction in annual growth corresponds to a five-year delay in unconstrained traffic forecast growth such that passenger numbers achieved in FY2047 in the main traffic forecasts would instead be reached in FY2052.

A7.5 Figure A7.1 below shows the reduction in traffic growth between the main forecast and the sensitivity.

Figure A7.1 Unconstrained forecasts under the main and sensitivity scenarios



Note: Main forecasts refer to ICF's unconstrained traffic forecasts for the whole London system (consisting of Gatwick, Heathrow, London City, Stansted, Luton, and Southend airports). Sensitivity refers to Oxera's adjusted unconstrained traffic forecasts with a slower growth assumption.

Source: ICF traffic forecasts, Oxera analysis.

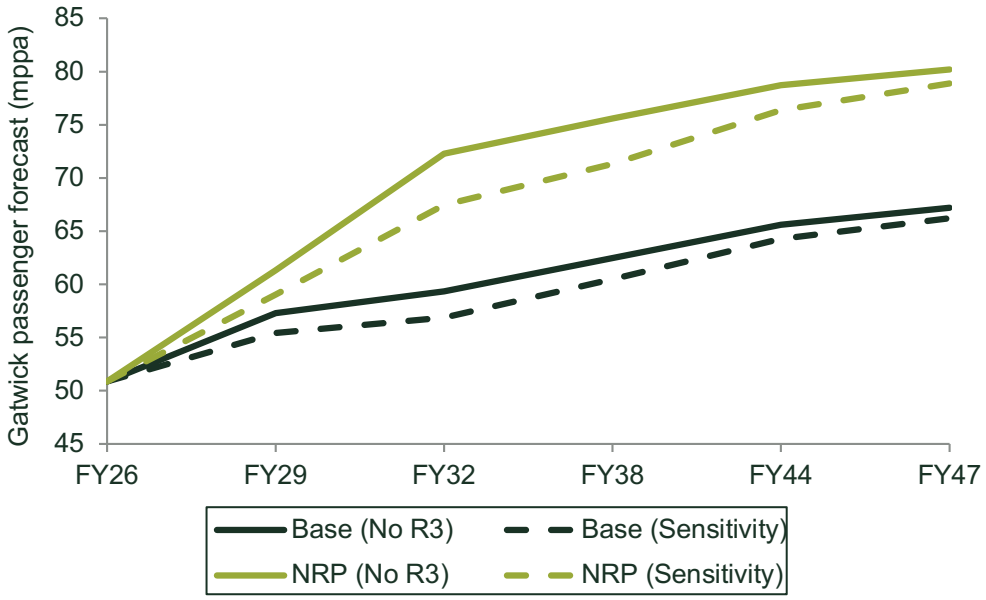
A7.6 To produce this sensitivity, we have followed these five steps:

1. We calculated the annual growth rate in passenger traffic which would result in unconstrained passenger volume forecasts being delayed by five years (i.e. FY2047 passenger numbers would be reached in FY2052 instead);
2. We then calculated the difference in the annual passenger volume growth rate between unconstrained forecasts under the main traffic forecast and the sensitivity (–22%);
3. We established new Base and Northern Runway traffic forecasts by adjusting their respective annual passenger volume growth rates by the percentage reduction (–22%) estimated in step 2 above;
4. With these new Base and Northern Runway traffic forecasts from step 3, we produced sensitivity forecasts for the different segments of forecasts by applying this same proportional reduction in the growth rates of each segment. Those segments are:
   - forecasts for each individual airport in the London system (i.e. Gatwick, Heathrow, London City, Stansted, Southend, and Luton);
   - forecasts for each segment of traveller within a given airport (e.g. foreign/UK traveller or business/leisure traveller);
   - forecasts for each sub-segment of traffic for the London system as a whole and for each individual airport (i.e. short-haul, long-haul, domestic traffic);
5. We used the passenger volume forecasts to produce direct employment forecasts for the Base and Northern Runway scenarios using the implied long-term elasticity of employment from ICF's employment forecasts.[318]

A7.7 Figure A7.2 below shows the resulting sensitivity traffic forecasts for Gatwick. Compared to the main traffic forecasts (shown as the 'No R3' forecasts on the chart, see also Figure 3.4 in section 3C), the sensitivity forecasts show slower passenger growth and the added traffic from the Project compared to the baseline is also lower. For instance in 2047, the main forecast of passengers in that year is 67.2m in the base scenario and 80.2m in the NRP scenario; while in our sensitivity forecast, the passenger numbers will shrink slightly to 66.2m in the base scenario and 78.9m in the NRP scenario.

[318] We first use the adjusted passenger forecasts to compute the (total) adjusted employment numbers at Gatwick airport. We then allocate the total adjusted employment estimate to each employment category (i.e. pilot, catering, etc.) by assuming the share of each category will remain the same as in the ICF forecasts.

Figure A7.2 Sensitivity traffic forecasts for Gatwick Airport



Source: Oxera analysis based on ICF traffic data.

A7.8 The remainder of this appendix is structured as follows.

- Subsection A7B sets out our assessment of the impact of the Project under these sensitivity forecasts at the national level.
- Subsection A7C contains Oxera's analysis of the local economic impacts for the sensitivity forecasts. We estimate both gross and net impacts on the three study areas.
- Subsection A7D concludes on the effect of these sensitivity forecasts on the economic impact of the Project.

A7B National impact sensitivity

A7.9 Slower traffic growth would result in the additional capacity that the Project would provide being utilised later than suggested by the main traffic forecasts, causing benefits to be realised over a longer period of time. This is likely to reduce the estimated impact of the Project on the UK society.

A7.10 Our analysis suggests that under this sensitivity, the Project would still generate total benefits to the users and providers of aviation services and to the wider UK economy valued at £14.1bn to £20.2bn compared to £16.7bn to £25.6bn total benefits estimated in our main analysis.

A7.11 In subsection A7B.1, we present the user and provider benefits in the sensitivity scenario. Subsection A7B.2 describes the wider economic impacts and the overall benefits from the sensitivity analyses.

A7B.1 User and provider impacts sensitivity

A7.12 Table A7.1 sets out the present values of benefits to users and providers in the London aviation market using the sensitivity passenger forecasts. As in the main scenario, we present the benefits for different estimated price floors.[319]

A7.13 According to our analysis, the lower level of passenger traffic in the sensitivity scenario would result in a reduction in the user and provider benefits. However, the project would still bring substantial benefits to users of aviation services over the 60-year appraisal period, which are estimated to range between £52.9bn and £63.5bn.

Table A7.1 Total benefits to users and providers in the London aviation system—sensitivity results (£bn)

Proportion of other costs included in the price floor	75%	50%	25%
Leisure passenger benefits—fare effects	16.2	16.2	16.2
Leisure passenger benefits—travel time	0.2	0.2	0.2
Business passenger benefits—fare effects	36.3	46.9	46.9
Business passenger benefits—travel time	0.1	0.1	0.1
Total user benefits	**52.9**	**63.5**	**63.5**
Airline benefits	-48.7	-56.1	-54.3
Change in airport revenues	1.8	1.8	1.8
Total provider benefits	**-46.8**	**-54.3**	**-52.4**
Present value of benefits to users and providers	**6.1**	**9.2**	**11.1**

Note: All values are in discounted 2010 real prices. Numbers may not sum due to rounding. Benefit ranges represent benefits at different values of the proportion of other costs included in minimum fares. International-to-international transfer passengers have been excluded from the passenger numbers and the surplus calculations. Benefits to existing passengers are the additional value to air passengers from air travel who travel at lower fares with the Project. Benefits to new passengers are the difference between the maximum amount that passengers would be willing to pay and the actual price that they pay for aviation services. Business and leisure passenger benefits are sums of benefits to existing and new passengers in each market. Fare effects refer to benefits from reduced fares. Travel time effects refer to benefits from reduced average travel times. Airline benefits reflect a welfare transfer from airlines to passengers with the Project. As discussed in section 4C.4, we use various assumptions to identify the level of minimum prices that airlines may offer to ensure prices are above predicted costs—i.e. price floors. Columns 2–4 of the table illustrates the Project's expected impact on the users and providers at each of these assumptions. Price floors calculated using 25% and 50% assumptions are not estimated to be limiting in the relevant passenger markets, resulting in identical estimated benefits.

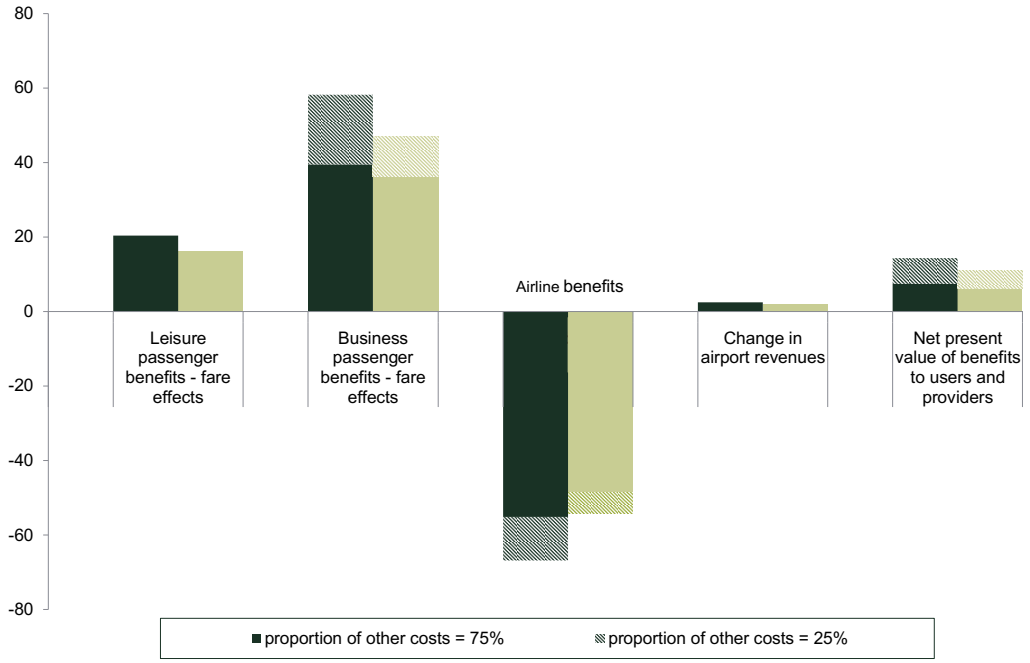
Source: Oxera analysis.

A7.14 Overall, our results indicate that the project would generate total benefits to users and providers valued at £6.1bn–11.1bn compared to £7.3–14.3bn in our main scenarios.

A7.15 Figure A7.3 below provides a comparison of the benefits to users and providers of aviation services between the main and the sensitivity scenarios, illustrated in dark green and light green bars respectively.

[319] We limit the minimum prices airlines would set to ensure that prices are always set above costs; i.e. use price floors, using various assumptions on what the estimated minimum cost level would be. We explain this in detail in section 4C.4..

Figure A7.3 User and provider benefits for main and sensitivity scenarios (£bn)



Note: All values are in discounted 2010 market prices. Dashed areas represent uncertainty arising from using varying assumptions in calculating the price floor.

Source: Oxera analysis.

A7B.2 Wider economic impacts sensitivity

A7.16 As explained in section 4D, the project is expected to create benefits to the wider economy, such as productivity gains through agglomeration benefits or people moving to more productive jobs. It is also expected to bring benefits to the government through increasing tax revenues from the APD paid for the additional passengers.

A7.17 Table A7.2 summarises the benefits to the wider economy and the government when the adjusted passenger forecasts are deployed.

Table A7.2 Benefits to the wider economy sensitivity (£bn)

Proportion of other costs included in the price floor	75%	50%	25%
Output change in imperfectly competitive markets	3.6	4.7	4.7
Move to more or less productive jobs	0.1	0.1	0.1
Agglomeration benefits	0.6	0.6	0.6
Wider economic impacts	**4.3**	**5.4**	**5.4**
Government revenues	3.7	3.7	3.7
Present value of benefits to the wider economy and the government	**8.1**	**9.1**	**9.1**

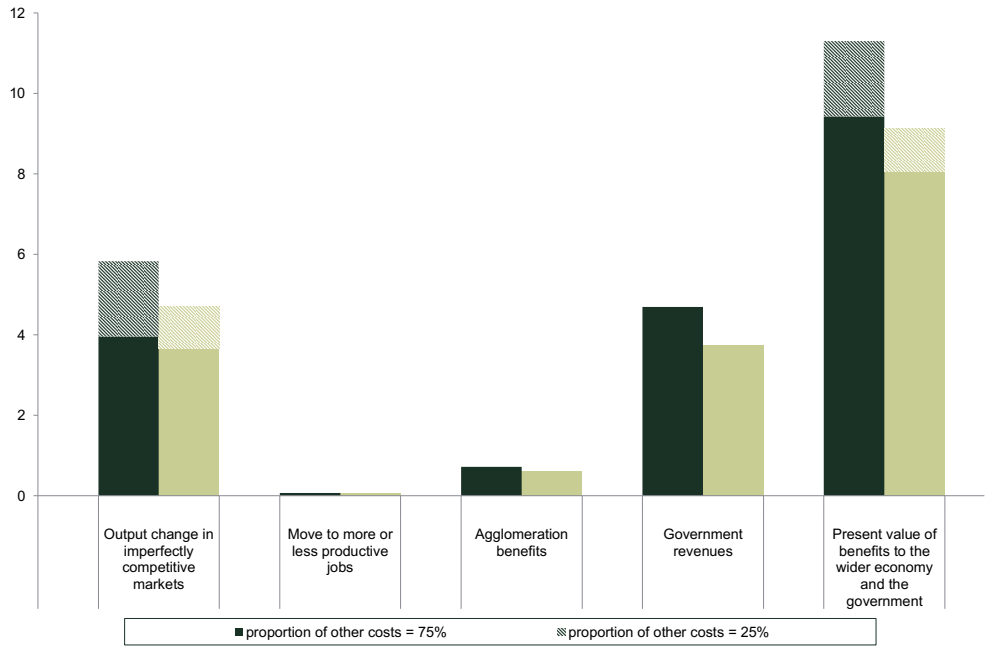
Note: All values are in discounted 2010 real prices. Numbers may not sum due to rounding. Benefit ranges represent benefits at different values of the proportion of other costs included in the calculation of price floors. This only affects benefits associated with output change in imperfectly competitive markets. Price floors calculated using 25% and 50% assumptions are not estimated to be limiting in the relevant passenger markets, resulting in identical estimated

benefits. This sensitivity excludes marginal external costs that are assessed in our main analysis as we do not have surface access data associated with our sensitivity traffic forecast.

Source: Oxera analysis.

A7.18 We estimate that the wider economic impacts of the Project and the additional tax revenues would bring benefits ranging from £8.1bn–9.1bn in this sensitivity. Figure A7.4 compares the different components of these benefits for the main (dark green) and the sensitivity (light green) scenarios.

Figure A7.4 Benefits to the wider economy and the government for main and sensitivity scenarios (£bn)



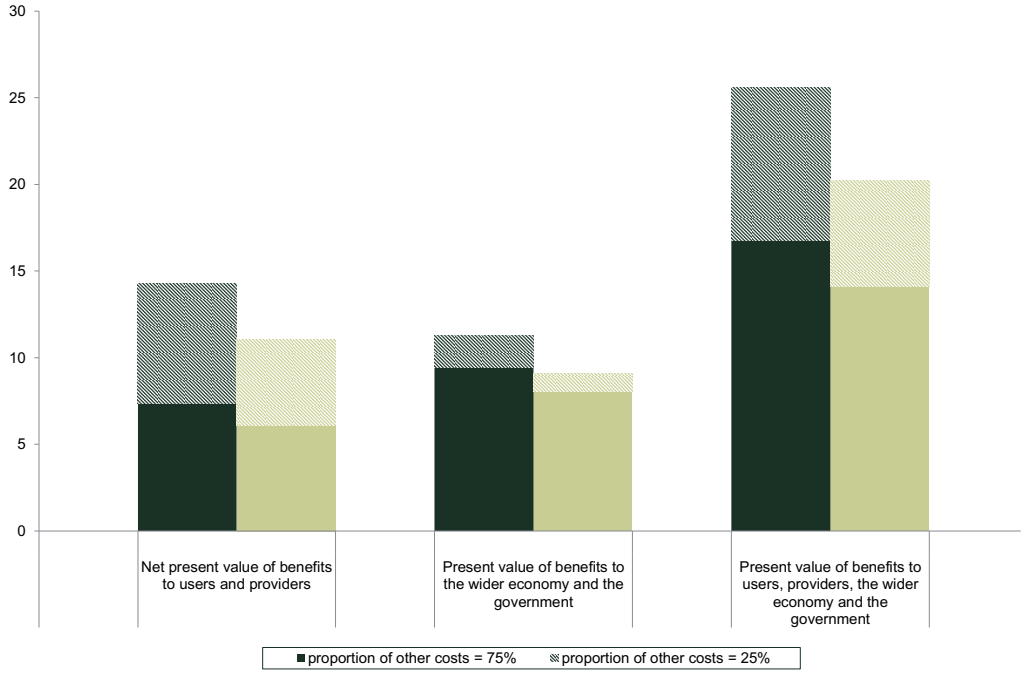
Note: All values are in discounted 2010 real prices. Dashed area in benefits associated with output change in imperfectly competitive markets represent uncertainty arising from varying assumptions in calculating the price floor.

Source: Oxera analysis.

A7B.3 Conclusion

A7.19 A slower growth in passenger numbers would decrease the benefits arising from the Project. We estimate that the present value of total benefits to users, providers, the wider economy and the government would be between £14.1bn and £20.2bn compared to £16.7bn to £25.7bn in our main analysis. Figure A7.5 provides a comparison of the present value of benefits between the main (dark green) and the sensitivity (light green) scenario.

Figure A7.5 Present value of benefits for main and sensitivity scenarios (£bn)



Note: All values are in discounted 2010 market prices. Dashed areas represent uncertainty arising from using varying assumptions in calculating the price floor.

Source: Oxera analysis.

A7C Local economic impact sensitivity

A7.20 We present here the results of our local impacts analysis using the sensitivity forecasts as inputs. We then compare the results of the sensitivity analysis with the estimates for the main forecasts to illustrate the effect of long-term lower growth in demand on the forecasted economic impact of the Project.

A7.21 Our results suggest that with the adjusted slower growth in passenger numbers, the Project is still expected to bring economic benefits to the UK economy. When comparing with the main scenario presented in section 5, it appears that lower passenger numbers have a transitory effect on the economic benefits of the Project.

A7.22 In the following subsections, we present the results for the footprint (subsection A7C.1) and the net economic impact (subsection A7C.2) sensitivity analyses.

A7C.1 Economic footprint sensitivity

A7.23 Table A7.3 below presents the results of the incremental footprint of the Project (i.e. the additional value of the Gatwick expansion over the Baseline scenario), using the adjusted lower passenger numbers. As in the main scenario, we present the results for the four assessment years: 2029, 2032, 2038, and 2047 broken down by type of impact (direct, indirect, and catalytic).

Table A7.3 Economic footprint sensitivity – UK-wide

	2029	2032	2038	2047
Total GVA (£m)	**£375m**	**£964m**	**£1,016m**	**£1,761m**
Direct	£67m	£207m	£237m	£318m
Indirect	£117m	£359m	£412m	£552m
Catalytic	£190m	£399m	£367m	£891m
Total employment	**5,400**	**13,300**	**12,600**	**18,600**
Direct	900	2,600	2,700	3,000
Indirect	1,700	5,100	5,200	5,900
Catalytic	2,800	5,600	4,700	9,600

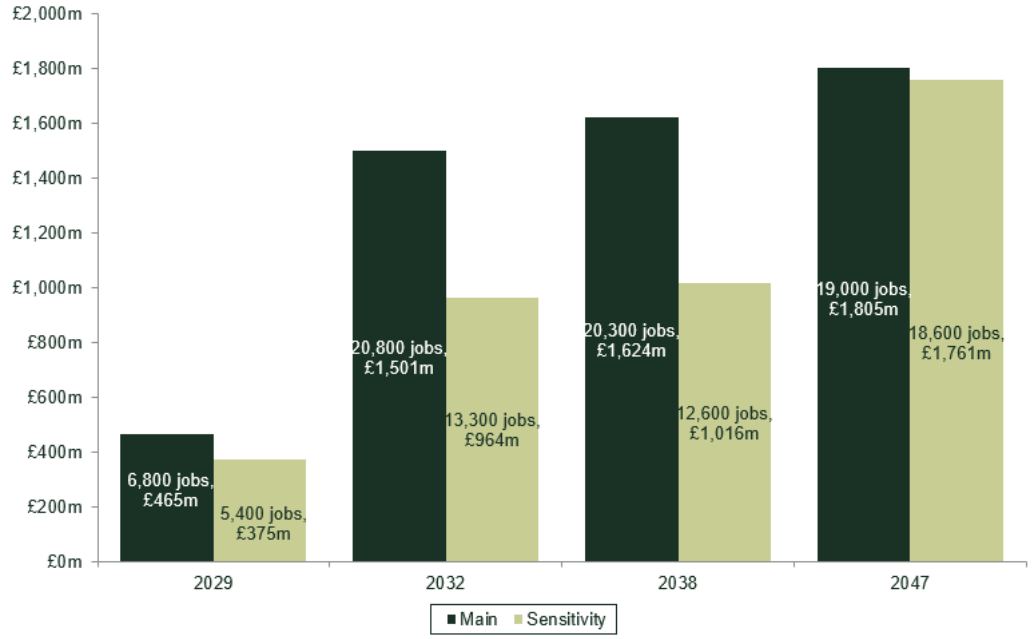
Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

A7.24 Overall, the footprint impact decreases compared to our main analysis, but still remains consequent. In 2038, our estimates suggest that the Project will generate up to £1.0bn GVA and 12,600 jobs in the UK, including £891m GVA and 11,000 jobs within the Five Authorities area. These results show that the slower traffic growth would have a significant but transitory effect on the incremental economic impact of the Project.

A7.25 Figure A7.6 below compares the economic footprint between main and sensitivity scenarios.

Figure A7.6 Economic footprint (Main and sensitivity scenarios)



Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

A7.26 As shown above, the impact of the lower passenger growth in the sensitivity is transitory and narrows down in the long run (i.e. by 2047). As traffic forecasts diverge significantly in the intermediate years (i.e. 2032 and 2038 as shown in Figure A7.1) so do the impact estimates. The difference in impacts is greater in

these intermediate years where the incremental passenger traffic due to the expansion is much lower compared to ICF's forecasts. As a result, you would have less direct employees (from less traffic at Gatwick), less supply-chain activity (from less on-site activity), and more importantly less catalytic activity in the local area (from less traffic at Gatwick).

A7.27 In the next section, we discuss the net economic impact estimates based on the sensitivity forecasts.

A7C.2 Net economic impact sensitivity

A7.28 As introduced in section 5D.1, compared to the footprint analysis, the net economic impact additionally takes into account the alternative uses that resources and people which would be mobilised for the expansion could have absent the Project. For example, a job created at the airport may be taken up by a person who would otherwise be in employment somewhere else or who would gain employment somewhere else in the local area (or indeed elsewhere in the UK). Net economic impacts therefore reflect these impacts generated above and beyond those that would have arisen anyway had people employed at Gatwick been doing something else.

A7.29 Table A7.4 below presents the estimated net economic impact of the Project. As in the main scenario, the impact is expected to increase over time. With the lower passenger numbers, the Project will still lead to 8,900 jobs and £715m in GVA generated within the Five Authorities area in 2038.

Table A7.4 Net economic impact sensitivity

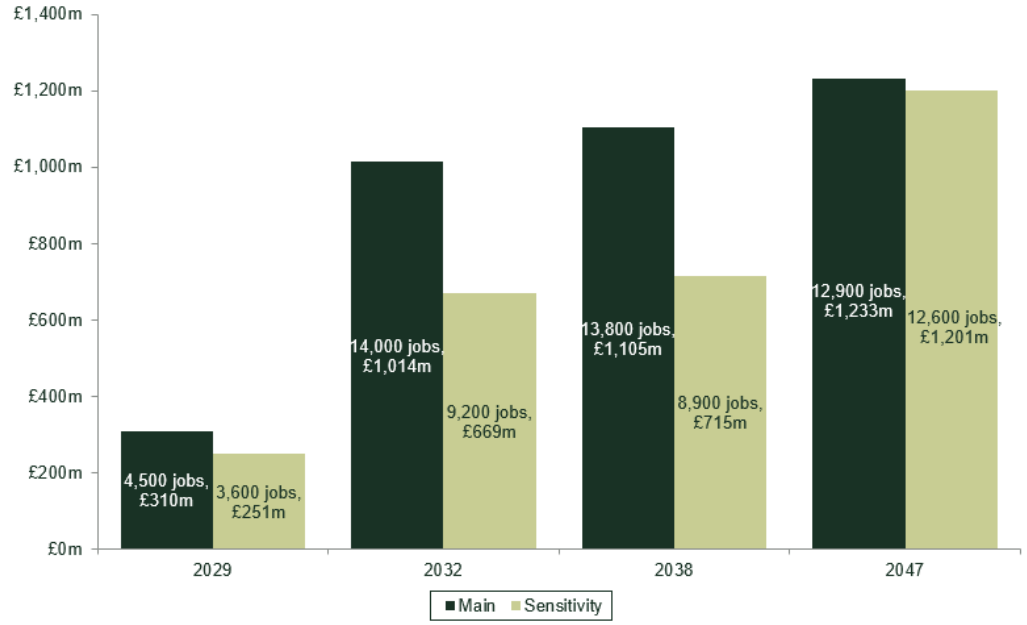
	2029	2032	2038	2047
Total GVA (£m)	**£251m**	**£669m**	**£715m**	**£1,201m**
Labour supply	£58m	£182m	£207m	£278m
Job productivity	£4m	£11m	£13m	£17m
Net catalytic	£189m	£477m	£495m	£905m
Total employment	**3,600**	**9,200**	**8,900**	**12,600**
Labour supply	800	2,500	2,500	2,900
Net catalytic	2,800	6,700	6,300	9,700

Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Values may not sum due to rounding. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

A7.30 Figure A7.7 below compares the net economic impact between the main scenario and the sensitivity.

Figure A7.7 Net economic impact (Main and sensitivity scenarios)



Note: Entries correspond to the difference between the Project estimates and Baseline scenario estimates. Estimates are reported in 2021 prices. Employment figures are expressed as headcounts.

Source: Oxera analysis.

A7.31 Same as with the economic footprint analysis, the impact of the lower passenger growth in the sensitivity is transitory and narrows down in the long run (i.e. by 2047). The difference in impacts is greater in these intermediate years (2032 and 2038) where the incremental passenger traffic due to the expansion is much lower compared to ICF's forecasts. As a result, employment on-site generated by traffic at Gatwick is lower (and so are labour supply and job productivity impacts) as well as local employment within the Five Authorities area generated by the airport's activity (catalytic impact).

A7D Conclusion

A7.32 Despite the lower passenger numbers, the Project is still expected to generate significant economic impacts. Compared to the main scenario, there is a noticeable difference in the magnitude of impacts for a transitory period, due to the slower growth in passenger numbers. However, over time the impact in the sensitivity scenario will catch up and in the long run, there are be no significant differences in the economic benefits created by the Project between the main and sensitivity scenarios.

A8 Airport activity and local employment in the UK

A8A Introduction

As the majority of the data we use is from 2018 and before, this result is based on pre-COVID-19 labour market conditions and air traffic levels.

A8.1 Gatwick airport has commissioned Oxera to test for evidence on the existence of a local employment effect of changes in air traffic in the UK. We undertake this analysis by applying an approach used in the academic literature with UK data.

A8.2 Increased activity at an airport is expected to have impacts on local and national economies through different mechanisms such as lower fares, increased productivity, trade, and employment. Various methodologies exist to appraise these benefits;[320] however, evidence on how these effects vary across countries is scarce.[321]

A8.3 Employment impact of changes in airport activity is positively associated with increased gross and net local employment mainly through:

- direct employment: the employment generated by the activity at the airport site;
- indirect employment: the employment generated by the supply chain of the firms active on the airport site;
- catalytic employment: the employment generated by businesses located in local areas near the airport due to the connectivity the airport provides.

A8.4 Direct and indirect gross employment can be estimated using various methodologies, for example surveys and input-output approaches.[322] However, estimation of the total net employment impact, i.e. including catalytic employment and within-region displacement, requires the use of econometric methods in the absence of extensive surveys to capture local employment impacts in addition to employment at an airport and its supply chain and the resulting displacement within the airport's local area.

A8.5 A number of academic econometric studies analyse the impact of air traffic on employment using a variety of data types and corresponding approaches. Overall, these studies conclude that increased air traffic activity is positively associated with increased local employment—the estimated change in regional employment resulting from a unit percentage change in air traffic ranges from 0.02% to 0.18%. Table A8.1 outlines the data types, approaches, and conclusions of these studies. No similar study that makes use of UK data is available to inform us on the existence or the level of an impact of air traffic on local employment levels in the UK.

[320] IATA (2007), 'Aviation Economic Benefits', IATA Economics Briefing No:8, July.
[321] Economic impacts of an infrastructure scheme is likely to be country-specific due to cross-country institutional differences. For example, employment impacts of an aviation scheme would depend on the labour market institutions of a country. Most studies focus on the US market, where the number of airports is high, to appraise such impacts as we illustrate in Table A8.1.
[322] InterVISTAS (2015), 'Economic Impact of European Airports A critical Catalyst to Economic Growth', prepared for ACI Europe, pp. 13–16.

Table A8.1 Literature presents evidence that increased air traffic is positively associated with local employment

	Data type	Approach	Conclusion
Button et al.[1]	Cross-section of US cities	Ordinary least squares	Having a hub airport in a region is associated with on average a 71.6% increase in employment in the high-technology sector.
Poort et al.[2]	Pooled panel of European airports	Three stage estimation	1% increase in air traffic increases net local employment in the service sector by 0.18%.
Green[3]	Panel of US metropolitan areas	Two stage estimation	Passenger activity is a powerful predictor of local employment growth. 1 standard deviation increase in air traffic increases decadal local employment growth by 9%. Decadal employment growth in cities with hub airports are higher by 8.4% to 13.2%.
Brueckner[4]	Cross-section of US metropolitan areas	Two stage estimation	1% increase in air traffic increases net total local employment by 0.09% and net local employment in the service sector by 0.11%.
Blonigen[5]	Panel of US metropolitan areas	Ordinary least squares	1% increase in air traffic growth increases net local employment growth by 0.07%.
Percoco[6]	Cross-section of Italian cities	Two stage estimation with a non-linear first stage and a linear second stage	1% increase in air traffic increases net total local employment 0.02% and net local employment in the service sector by 0.04%. It also has spillover effects on the net total employment level and the service employment level in the neighbouring regions by 0.01% and 0.02%, respectively.

Note: A cross-sectional data is a collection of different observations at a point in time. A panel data instead follows the same units of observations, for example cities, over time. A pooled panel assumes observations for the same panel unit are independent from each other. [1] Button, K., Lall, S., Stough, R. and Trice, M. (1999), 'High-technology employment and hub airports', *Journal of Air Transport Management*, **5**:1, January, pp. 53–59. [2] Poort, J.P., Sadiraj, K. and van Woerkens C.M.C.M. (2000), 'Hub, of spokestad? : regionaal-economische effecten van luchthavens', NYFER, p. 14. [3] Green, R.K. (2007), 'Airports and Economic Development', *Real Estate Economics*, **35**:1, February, pp. 91–112. [4] Brueckner, J.K. (2003), 'Airline Traffic and Urban Economic Development', *Urban Studies*, **40**:8, July, pp. 1455–1469. [5] Blonigen, B.A. (2012), 'Airports and Urban Growth: Evidence from a Quasi-Natural Policy Experiment', NBER Working Paper No: 18278, August, p. 34. [6] Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, *Urban Studies*, **47**:11, September, pp. 2427–2443.

Source: Oxera.

A8.6 In the absence of UK-specific evidence, in previous work for GAL we used the results of Percoco's study (which is a variation of Brueckner's study) summarised in the table above as a proxy to assess the local employment impact of an airport in the UK.[323] This study is particularly suitable to use in our replication study for a number of reasons:

- it relies on publicly available cross-sectional data that can also be constructed for the UK;
- it enables the use of a larger sample size by providing a way to keep spatial units, or locations, for example counties, without active airports in the estimation data. Studies other than Percoco's study summarised in the table

[323] Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, *Urban Studies*, **47**:11, September, pp. 2427–2443. Percoco's approach is based on Brueckner's approach but alters it on the first stage to allow using locations without active airports and to prevent potentially negative predictions for passenger numbers. Oxera previously used this study as a proxy for the UK to assess the local economic impact of an airport in the UK.

above are able to construct datasets with reasonable sample sizes because of the number of regions with active airports in their country of study. However, in our UK sample, without this property, our sample size would be 32 instead of 144 as we describe in section A8C below, which would be a relatively small sample size.[324]

- it uses a two-stage estimation method to address endogeneity between air traffic and local employment;[325]
- contrary to two-stage estimation methods that use a linear first stage, it allows predicting only non-negative passenger numbers in the first stage of the estimation process. An accurate two-stage approach relies on accurate predictions in its first stage, and predicting negative passenger numbers at some locations would clearly reduce the accuracy in the first stage estimation, which in turn may significantly distort the estimated impact of air traffic on local employment.[326]

A8.7 We describe Percoco's econometric model, the UK data we use, and the results of our analysis in more detail below. Our analysis suggest that there is evidence in the UK that increased air traffic has a positive impact on local employment levels, and a unit percentage increase in air traffic increases local employment level by 0.13–0.14% on average.[327]

A8B The econometric approach

A8.8 The model proposed by Percoco takes the form of a two-stage regression analysis with a non-linear first stage. We also draw from Brueckner, which Percoco bases his model on. The two stages of the approach can be characterised as:

- predict what the air traffic would be at a location given instruments and other relevant observable traits in the first stage;[328]
- use these predictions in the second stage along with other observable control variables to estimate the impact of a change in air traffic on local employment levels.

A8.9 The first stage of Percoco's model assumes that air traffic at a location is only observed if the location has an 'air traffic potential' above a certain threshold—

[324] This is important to construct a cross-sectional dataset that provides enough power to obtain meaningful econometric estimates. A small sample size leads to large variations in the estimated effects, resulting in a high likelihood of inaccurately failing to reject a null hypothesis of no employment impact of air traffic on a local area even when there is actually an impact. There are other data types and econometric approaches, for example using a panel of locations with active airports and panel data approaches, to obtain a dataset with a reasonable sample size and to test whether air traffic affects local employment levels given that an airport is already active. Our study forms a part of potential approaches that can be used to answer this question and would complement other future studies on the presence and size of this effect in the UK.

[325] Endogeneity in this setting refers to the contemporaneous relationship between air traffic and local employment—air traffic may affect employment but employment may also partly affect air traffic. For example, spatial units with high employment may attract more business travellers. A two-stage approach addresses this problem by using an 'instrument' in the first stage to predict air traffic and using the predicted air traffic from the first stage regression in the second stage instead of the observed air traffic.

[326] Using a non-linear first stage in a two-stage estimation procedure yield more intuitive and accurate predictions however require additional identification assumptions than estimations using a linear first stage equation. For details see, for example, Newey, W.K. and Powell, J.L. (2003), 'Instrumental Variable Estimation of Nonparametric Models', *Econometrica*, **71**:5, October, pp. 1565–1578. The use of this approach is required to attain a reasonable sample size as the approach requires modelling of a censored data as we describe below at section A8B.

[327] As the majority of the data we use is from 2018 and before, this result is conditional on pre-COVID-19 labour market conditions and air traffic levels.

[328] An instrument is a variable that is related to local employment only through its impact on air traffic. For details see, for example, Cameron, A.C. and Trivedi, P.K. (2005), *Microeconometrics: Methods and Applications*, Cambridge University Press, pp. 95–103.

airports are only active in areas where there would be demand for their services.[329] The following non-linear relationship summarises this idea where x_i is observed air traffic for location i, $x_i^\star$ is air traffic potential, and μ is the threshold for observing some level of air traffic, for example the minimum air traffic potential required to operate an airport at a location.[330]

$$x_i = \begin{cases} 0, & \log(x_i^\star) < \mu \\ x_i^\star, & \log(x_i^\star) \geq \mu \end{cases}$$

A8.10 The traffic potential $x_i^\star$ is assumed to have an exponential relationship with some observed variables as in the following relationship where z are instrumental variables, d are control variables, β_0 is the constant term, and v_i is a location specific error term:

$$x_i^\star = \exp\left(\beta_0 + \sum_{k=1}^{K} \beta_k z_{k,i} + \sum_{l=K+1}^{L} \beta_l d_{l,i} + v_i\right)$$

A8.11 The second stage of Percoco's model uses the predicted air traffic potential, $\widehat{x_i^\star}$, from the first stage equation above to estimate the impact of changes in air traffic on local employment. This stage assumes a linear relationship between local employment and predicted air traffic potential and other control variables

$$y_i = \alpha_1 + \alpha_2 \widehat{x_i^\star} + \sum_{m=3}^{M} \alpha_m d_{m,i} + \varepsilon_i$$

A8.12 where α_2 is the measure of the impact of changes in air traffic on local employment that we aim to estimate.[331] We estimate this model by constructing a UK dataset; this is described in detail in the next section.

A8C Selection of control variables and construction of the dataset

A8.13 Our dataset is constructed using publicly available sources. We present these sources in section A8G.

A8.14 To measure our dependant variable, local employment, we use data on 2018 local employment levels from NOMIS.[332] As a measure of air traffic, we source

[329] A traffic potential refers to the expected level of air traffic that would be observed at a location if an airport were active at that location, which is unobserved (or observed as zero) for regions without an active airport. It is called a latent variable, which is a variable that is not directly observed but inferred from observed variables.

[330] This definition uses a log-normal variant of a standard Tobit model as illustrated in Carson, R.T. and Sun, Y. (2007), 'The Tobit model with a non-zero threshold', *The Econometrics Journal*, **10**:3, pp. 488-502. Percoco's model is a special case of this model where threshold in a standard Tobit model is set to zero. It corresponds to the threshold being 1 in the original unit of the latent variable μ, and could be interpreted as only 1 passenger would potentially use an airport if it existed at a location, which would be unlikely. We set the threshold for observing air traffic, μ, using the lowest level of air traffic in our dataset and use a maximum-likelihood approach to estimate the first stage model. For the consistency of this approach and the derivation of the maximum-likelihood function, see Carson, R.T. and Sun, Y. (2007), 'The Tobit model with a non-zero threshold', *The Econometrics Journal*, **10**:3, pp. 488–502.

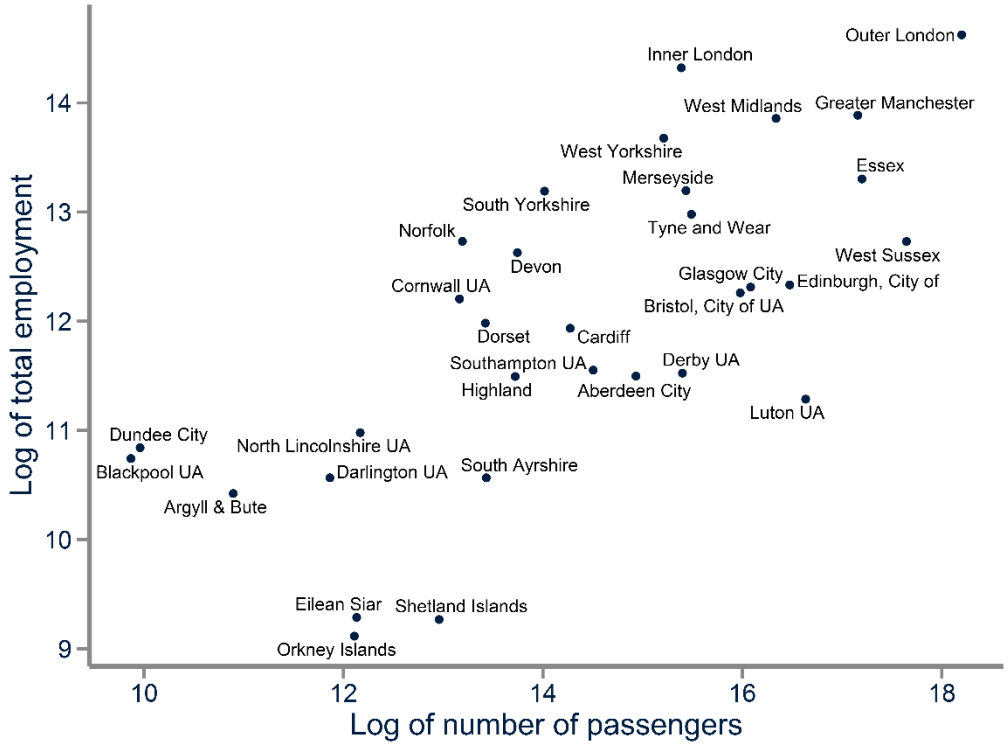
[331] We estimate the second stage equation using an ordinary least squares approach and correct the standard errors to account for the variation in the predicted air traffic potential and other potential issues, such as heteroskedasticity, using bootstrapping.

[332] NOMIS (2018), 'Annual Population Survey T11a Employment by age and industry (SIC 2007)', https://www.nomisweb.co.uk/, accessed 02 May 2019. We use the log level of employment in industrial and service sectors excluding Distribution, Hotels, and Restaurants (SIC 2007 codes G and I) at county/unitary authority level as measures of local employment. We exclude this category to avoid endogeneity issues as proposed by Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, Urban Studies, 47:11, September, p. 2435.

2018 air passenger levels for all UK airports from CAA.[333] We also present a sensitivity using the number of air transport movements (ATMs) instead of air passenger levels as a measure of air traffic.[334]

A8.15 We match airports with locations defined at county/unitary authority level. A list of airports and counties considered in our analysis is presented in section A8H.[335] The plot below illustrates the relationship between the number of air passengers and local employment at locations with an active airport. It shows the correlation between the number of air passengers and local employment levels, but does not inform us on the causal relationship as there could be other factors causing this observed relationship.

Figure A8.1 Air traffic and local employment are positively correlated



Source: Oxera.

A8.16 In the first stage of our regression, we use the following instrumental variables as discussed by Brueckner and Percoco to predict the unobserved air traffic potential:[336]

[333] Civil Aviation Authority (2018), 'Airport data Table 8 Air Passengers by Type and Nationality of Operator', https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-Airport-data/Airport-data-2018/, accessed 25 April 2019. We use the total number of terminal and transit passengers as a measure of air traffic.
[334] Civil Aviation Authority (2018), 'Airport data Table 3 Aircraft Movements', https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-Airport-data/Airport-data-2018/, accessed 25 April 2019. The sensitivity results are presented in Appendix A8F.
[335] An airport's employment impact would not be restricted to its county but would have impacts beyond the geographic borders. Ideally, one may calculate exact labour catchment areas for each airport in the UK, construct relevant control variables corresponding to each catchment area, and perform an analysis using this dataset. This means, however, hypothetical catchment areas have to be constructed for regions without an active airport. We therefore use a simplification and define local areas at county/unitary authority level. Brueckner uses 91 US metropolitan areas and Percoco uses 103 Italian provinces as the unit of location.
[336] For a discussion on the validity of these measures as instruments, see Brueckner, J.K. (2003), 'Airline Traffic and Urban Economic Development', *Urban Studies*, **40**:8, July, p. 1459.

- hub indicator—defined as one if an airport is a hub airport and zero otherwise;[337]
- centrality—defined as the distance of a location to the UK population centre of gravity;[338]
- proximity indicator—defined as one if a location is within 100kms of one of the top 5 locations with the highest air traffic level.[339]

A8.17 Following Percoco and Brueckner's guidance on relevant control variables, we use the following information in both the first stage and the second stage regressions:[340]

- average neighbouring population—as areas with higher population levels would have higher employment levels and attract more passengers;[341]
- the share of population older than 65—as age composition of an area could affect its employment level and air traffic potential;
- the level of human capital proxied by the share of population with a Q4 equivalent degree or above—as locations with a higher human capital would be more attractive for some employers and could attract more passengers;
- regional indicator variables for England, Wales, and Scotland—to partial out systematic differences in average local employment levels conditional on the other control variables.[342]

A8.18 In addition to these variables, we construct a measure of air traffic potential at neighbouring counties to test whether an increase in air traffic at a

[337] In our analysis, only Heathrow airport is categorised as a hub airport. In this sense, this variable only captures the level difference at Heathrow airport due to the connecting traffic in predicting passenger potential.
[338] We use the latitude, the longitude, and 2011 census population of each location to calculate the population centre of gravity. The geodesic distance is used to calculate the distance to the centre. We source the latitudes and longitudes from Office for National Statistics (2019), 'Local Authority Districts (December 2017) Full Clipped Boundaries in Great Britain', https://geoportal.statistics.gov.uk/datasets/local-authority-districts-december-2015-full-clipped-boundaries-in-great-britain, accessed 02 May 2019. This variable is measured in logs. As Green, as summarised at Table A8.1, also discusses, this variable measures the distance of an airport to a fix geographic location, which is assumed to be exogeneous and to have no impact on local economic development.
[339] The top five locations with the highest air traffic level are Essex (Southend and Stansted airports), Greater Manchester (Manchester airport), Luton (Luton airport), Outer London (Heathrow airport), and West Sussex (Gatwick airport). We use latitudes and longitudes of each location to calculate the distances with a geodesic distance metric. Brueckner uses 240km in the USA as his cut-off parameter.
[340] A control variable is a variable that relates to local employment and air traffic. Such variables, which are also called confounders, have to be controlled for in regressions to ensure that they do not confound the impact of air traffic on local employment. We use the average population of the closest five counties to each county to calculate the neighbouring population.
[341] As unobserved factors affecting employment are also likely to affect population, population of a location can potentially be endogenous. Brueckner and Percoco argue using a past population measure to overcome this problem. However, past population could also be a determinant of today's employment, for example due to propagation of the impacts of past employment shocks over time. A past local population measure constructed using 2001 census and current population also has a correlation more than 0.99, making it difficult to justify that the past population would present a solution to the endogeneity issue. This issue does not distort the first stage of our regression where we are interested in accurate prediction of air traffic potential and not in a causal interpretation. We therefore use population in the first stage regression to increase the accuracy of our predicted air traffic potential. In the second stage regression, instead of using a past population measure as a proxy, we proxy population of a region with the average of the populations of its five closest neighbours using 2011 census estimates. This variable is measured in logs.
[342] An indicator variable for Scotland (Wales) is 1 if a location is in Scotland (Wales) and zero otherwise. Our regressions do not include an indicator variable for England as it is set as the base for regional indicators. This choice does not affect the coefficient estimate of the other variables. Our analysis excludes Northern Ireland due to lack of comparable data from the same source on local observables described above.

neighbouring location affects local employment.[343] We use this variable only in the second stage as its construction requires predicted air traffic potential from the first stage.

A8.19 The table below presents descriptive statistics for these variables.

Table A8.2 Descriptive statistics for these variables

	Min	Average	Standard Deviation	Max
Employment – Total	9,100	177,924	280,080.7	2,240,900
Employment – Services	6,500	135,885	232,070.4	1,885,800
Employment – Industrial	2,500	42,039	51,890.2	355,100
Number of passengers	0	1,967,354	8,611,065	80,124,537
ATMs	0	15,166	54,422.5	475,714
Local population	21,349	426,174	633,319.5	4,942,040
Average neighbouring population	97,522	397,367	346,418	2,127,979
Share of 65+	0.09	0.20	0.04	0.29
Share of Q4+	0.18	0.36	0.08	0.66
Scotland indicator	0	0.22	0.42	1
Wales indicator	0	0.15	0.36	1
Centrality	3.8	148.3	89.2	547.7
Proximity indicator	0	0.42	0.49	1

Note: Observations are at the county level. Statistics for employment, local population, average neighbouring population, and centrality refer to their levels. In our regressions, these variables are used in the log form. All information relates to 2018, except population, which is sourced from the 2011 census.

Source: Oxera.

A8D Results

A8.20 The purpose of the first stage regression is to use the correlation between instrumental variables, control variables and the dependent variable to obtain accurate predictions of the unobserved air traffic potential.[344] The table below presents the estimates from the first stage regression.

[343] This variable to measure potential spillover effects has to be generated after the unobserved air traffic potential is estimated. We therefore explain how this variable is constructed in section A8D. For more details, see Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, *Urban Studies*, **47**:11, September, p. 2438.

[344] A first stage regression in a two stage least squares estimation does not provide a causal interpretation of the relationship between dependent variables and the independent variable.

Table A8.3 First-stage regression results

	Estimate
Constant	-51.34***
	(14.18)
Share of 65+	-0.51***
	(0.20)
Population	3.28***
	(0.70)
Centrality	5.49***
	(1.25)
Share of Q4+	-0.03
	(0.08)
Proximity indicator	-1.21
	(1.56)
Hub indicator	0.50
	(1.55)
Scotland indicator	6.49***
	(1.99)
Wales indicator	2.19
	(6.17)
Number of observations	**144**

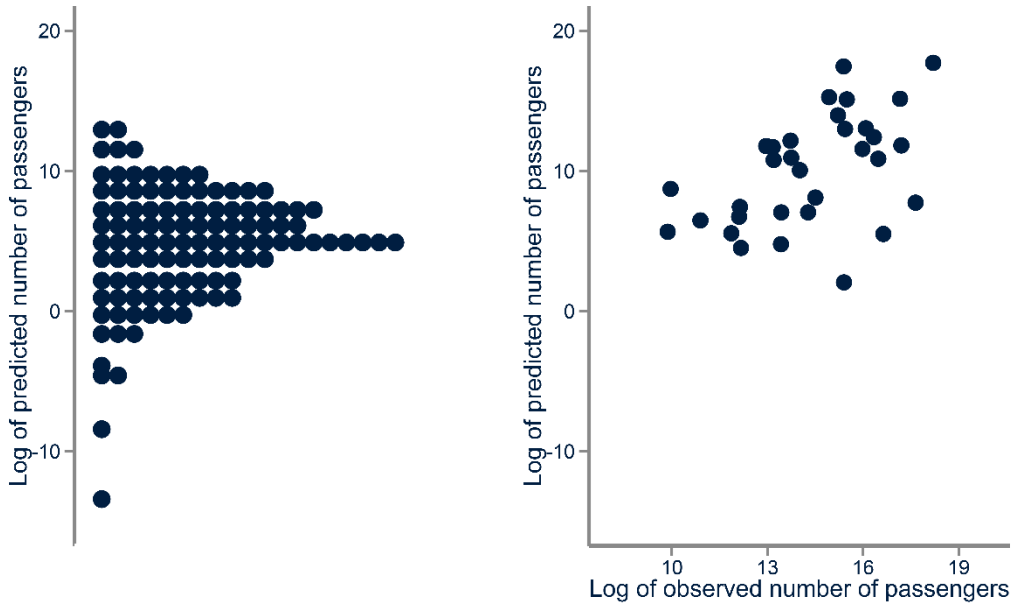
Note: Estimates are rounded to two decimals. Values in parentheses are standard errors. *** indicates statistical significance at 1% level of confidence. Standard errors and confidence intervals are calculated using bootstrapping with 1000 repetitions without replacement. Population and centrality are measured in logs.

Source: Oxera.

A8.21 Using the first stage regression, we predict air traffic potential for all areas in our analysis. The plot below shows the predicted air traffic potential for areas without an active airport on the left pane and for areas with an active airport on the right pane. Intuitively, airport potential of most areas without an active airport is predicted within the low end of the predicted potential for the areas with an active airport.[345]

[345] Even though a high predictive accuracy is not necessary for the consistency of a two-stage least squares estimator, it is a desirable property. However, in this case, it is difficult to assess the predictive accuracy of the first-stage model as what is predicted is an unobserved variable as described in section A8B. As shown in the plot, the first stage regression is able to capture a strong correlation between the predicted number of passengers and the observed number of passenger for counties/unitary authorities with an active airport (with a few outlying observations). It also predicts the air traffic potential at regions without an active airport at the lower end of the distribution as one would expect if airports would be systematically open at locations with demand for their services.

Figure A8.2 Predictions from the first stage regression



Note: Each point on the plots represent a county. The plot to the left illustrates the distribution of the log of predicted air traffic potential for regions without an active airport, and hence have zero observed air traffic. The plot to the right illustrates the log of predicted air traffic potential for regions with an active airport on the y-axis and the log of observed air traffic on the x-axis.

Source: Oxera.

A8.22 To measure the spillover effects of increased air traffic in a region on neighbouring counties in our second stage regression, we construct a variable to represent the air traffic potential at the neighbouring counties of each county using:

- the predicted air traffic potential of each county;
- weights based on distances between each county;
- a cut-off value to define the neighbouring regions based on distances, as described in Box A8.1.

A8.23 The box below explains how this variable is constructed.

Box A8.1 Constructing a measure of neighbouring air traffic potential

A measure of neighbouring air traffic potential is needed to test whether changes in air traffic have spillover employment effects in the neighbouring regions. Below, we explain how we construct this measure following Percoco's definition.[346]

First, we calculate distance weights. For each location in our dataset, we calculate distances to all the other locations using latitudes, longitudes, and the geodesic function. We then identify the closest neighbouring locations to each location.[347] Using these sets of closest locations, we calculate weights using the squared-inverse distances. For example, if location A has two neighbouring locations B and C at distances 2 and 5, weight for location B at the neighbourhood of location A is calculated as:

$$\frac{\left(\frac{1}{2}\right)^2}{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{5}\right)^2} = 0.86$$

Second, we multiply the predicted air traffic potential of each region in the set of closest locations with corresponding weights to calculate the neighbouring traffic potential for each region. For example, if location B has a predicted air traffic potential of 100 and location C has a predicted air traffic potential of 300 from the first stage regression, location A's neighbouring traffic potential is calculated as:

$$0.86 \times 100 \; + \; 0.14 \times 300 \; = \; 128$$

Source: Oxera.

A8.24 We analyse the employment effect of a change in the air traffic using total employment, employment in the service sector, and employment in the industrial sector separately as dependent variables. The table below illustrates results from these regressions. The impact of air traffic on total local employment is estimated as 0.14, indicating a 0.14% increase in total employment as a response to a 1% increase in local air traffic.[348] The impact on industrial and service sectors are also similar, ranging from 0.13% to 0.14% increases as a response to a 1% increase in local air traffic, respectively.[349] These impacts are estimated as statistically significant at the 1% level.[350]

A8.25 We also identify a significant spillover employment effect of increased air traffic in the neighbouring region of a county. We estimate the coefficient of neighbouring air traffic potential as -0.07, indicating a 0.07% displacement from a region if air traffic in the region's neighbouring area increases by 1%.[351] This finding implies that increased activity at an airport could attract employment from neighbouring regions to the area closer to the airport in the UK. This

[346] Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, *Urban Studies*, **47**:11, September, p. 2438.
[347] For each location, we sort all the other locations from the closest to the farthest and define the closest 5% as the neighbouring locations.
[348] All interpretations assume all else remains equal, represent average impacts, and conditional on the prevailing labour market conditions and air traffic levels in the UK in 2018.
[349] Brueckner estimates the impact of a 1% change in air traffic at the US metropolitan areas on employment in the service sector as 0.11% and on total employment as 0.09%. The difference between the total employment estimates and the service sector employment compared to our study is because Brueckner's preferred specification does not yield a significant impact of air traffic on industrial employment. His sensitivities, however, indicate a negative impact of increased air traffic on industrial employment levels, which may be driven by his sample selection of metropolitan areas. Percoco estimates a 0.04% impact on employment in the service sector and a 0.01% impact on total employment. Percoco interprets the very low impact relative to the rest of the literature as evidence for stickiness of the Italian labour market and limitations imposed by the labour market institutions in Italy.
[350] The statistical significance test provides the probability that we would estimate a non-zero effect given the dataset and the model, if in fact the effect were zero. Common thresholds are 10%, 5% and 1%. Statistical significance therefore gives the degree of confidence that the observed relationship is not due to pure coincidence.
[351] Neighbouring air traffic potential is a weighted average of all neighbouring regions of a location as described in Box A8.1 . All else remaining the same, a 1% increase in the air traffic of a single neighbouring region therefore would be a less than 1% increase in the neighbouring air traffic potential.

finding is different from Percoco's finding on positive spillover effects to neighbouring regions in Italy, which may be a result of differences in regional definitions,[352] differences in commuting patterns, or other reasons affecting mobility and labour market dynamics between Italy and the UK, justifying the need to conduct a specific analysis using UK data that reflects the impact of UK institutions and market conditions.

Table A8.4 Second-stage regression results

	Estimate (Log of total employment)	Estimate (Log of industrial employment)	Estimate (Log of service employment)
Constant	3.58***	3.08***	3.01***
	(1.16)	(1.08)	(1.19)
Air traffic	0.14***	0.13***	0.14***
	(0.03)	(0.03)	(0.03)
Neighbouring air traffic potential	-0.07***	-0.07***	-0.07***
	(0.02)	(0.02)	(0.02)
Population proxy	0.48***	0.50***	0.50***
	(0.09)	(0.08)	(0.09)
Share of 65+	0.03*	0.05**	0.03
	(0.03)	(0.03)	(0.03)
Share of Q4+	0.03***	0.02*	0.04***
	(0.01)	(0.01)	(0.01)
Scotland indicator	-0.87***	-0.68***	-0.92***
	(0.15)	(0.15)	(0.15)
Wales indicator	-0.28	-0.24	-0.30
	(0.69)	(0.67)	(0.70)
Number of observations	**144**	**144**	**144**

Note: Estimates are rounded to two decimals. Values in parentheses are standard errors. ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels of confidence. Dependent variables stated at the top of each column and independent variables, air traffic, neighbouring air traffic and population proxy are measured in logs.

Source: Oxera.

A8.26 Other control variables reflect expected impacts on employment in similar magnitudes to those reported by Percoco:

- higher education increases employment in a region where the effect is more pronounced in the service sector;
- Scotland and Wales indicators reflect regional differences in employment patterns given other regional characteristics;[353]
- an older population does not significantly affect service employment but increases total employment through industrial employment, indicating either

[352] Percoco uses Italian provinces and we use UK counties/unitary authorities as our unit of analysis.
[353] These variables capture the average impact of the regional differences on employment levels in the UK that is left out by the relationships captured by our other control variables. For example, some areas in Scotland may be more remote than those in England, making the definition of a neighbouring area very large and distorting the relationship between neighbouring impacts and local impacts. This may drive the estimate for Scotland indicator, making it at a similar level to Percoco's regional indicators for North and South Italy (-0.80) on total employment.

older populations locate in areas where these employment levels are systematically high given other controls or there could be other control variables that affect the relationship between the share of people who are 65+ at a location and employment levels in the UK demography.[354]

A8.27 In section A8F, we present a sensitivity of these results using ATMs instead of passenger numbers as a measure of air traffic. Outcome of this sensitivity is similar to our analysis above, however it suggests a higher employment impact and displacement from neighbouring regions as a response to changes in ATM numbers at around 0.19% and -0.11% compared to 0.13% and -0.07% discussed above.

A8E Conclusion

A8.28 Our analysis applies an approach used in the economic literature and makes use of the variation between locations in the UK to assess the impact of increased air traffic on local employment levels and suggest that a 1% increase in traffic levels increases local employment levels on average by 0.13% given the labour market conditions and air traffic levels prevalent in the UK in 2018. Alternative approaches that also make use of the variation over time at locations with active airports would supplement our analysis and provide a wider and more conclusive evidence base on the impact of air traffic on local employment levels to inform policy decisions on aviation infrastructure projects.[355] Moreover, recent changes towards remote working patterns, if becomes permanent, would have an effect on the relationship between air traffic and local employment levels; for example working from home may reduce the employment response in the service sector resulting from increased air traffic.

6.10 We also show that part of the increase we identify is driven by displacement from the neighbouring areas. The DfT's guidance on appraising employment effects of infrastructure projects provide guidance on alternative employment sources and when employment effects would be positive beyond a local economy and at the national level.[356]

A8.29 In the subsequent sections, we provide additional information on the sensitivity analysis around our results (section A8F), the data sources used in the analysis (section A8G), and the list of airports, counties, and unitary authorities included in the analysis (section A8H).

A8F Sensitivity results

A8F.1 Using ATMs as a measure of air traffic

A8.30 In the tables directly below, we present a sensitivity of our main analysis using ATMs as an alternative measure of air traffic instead of passenger numbers. The second stage regression results suggest a local employment impact from a 1% increase in air traffic at 0.19-0.20% spread across industrial and service employment levels and around 0.11% displacement if the air traffic in the neighbouring regions increases by 1%. Other results indicate similar

[354] Omission of these variables from the regression does not affect the estimated relationship between air traffic and employment levels as long the omitted variables do not jointly affect employment levels and air traffic. Percoco's findings indicate in Italy, areas with a higher share of people who are 65+ have lower employment all else being equal.
[355] Given enough time periods, such an analysis may also avoid the need for estimating a latent variable to increase the sample size and may have other desirable properties that are difficult to have in a cross-sectional analysis.
[356] Department for Transport (2018), 'TAG Unit A2.3 Employment Effects', May.

magnitudes and impacts between the control variables and the local employment levels as we have discussed in section A8D above.

Table A8.5 First-stage regression results

	Estimate
Constant	-32.93***
	(9.56)
Share of 65+	-0.35***
	(0.13)
Population	2.11***
	(0.46)
Centrality	3.82***
	(0.89)
Share of Q4+	-0.02
	(0.06)
Proximity indicator	-0.58
	(1.01)
Hub indicator	0.50
	(1.09)
Scotland indicator	4.57***
	(1.31)
Wales indicator	1.18
	(4.95)
Number of observations	**144**

Source: Oxera.

Table A8.6 Second-stage regression results

	Estimate (Log of total employment)	Estimate (Log of industrial employment)	Estimate (Log of service employment)
Constant	3.32***	2.76***	2.75***
	(1.16)	(1.10)	(1.19)
Air traffic	0.20***	0.19***	0.20***
	(0.05)	(0.05)	(0.05)
Neighbouring air traffic potential	-0.11***	-0.11***	-0.11***
	(0.04)	(0.04)	(0.04)
Population proxy	0.50***	0.46***	0.51***
	(0.09)	(0.09)	(0.09)
Share of 65+	0.04*	0.05***	0.03*
	(0.03)	(0.02)	(0.03)
Share of Q4+	0.04***	0.02*	0.04***
	(0.01)	(0.01)	(0.01)
Scotland indicator	-0.88***	-0.74***	-0.93***
	(0.14)	(0.14)	(0.14)
Wales indicator	-0.29	-0.24	-0.32***
	(0.96)	(0.93)	(0.960
Number of observations	**144**	**144**	**144**

Source: Oxera.

A8F.2 Using alternative hyperparameters

A8.31 As explained in more detail in section A8C and Box A8.2, we use the following hyperparameters to define some of our control variables:

- the closest five region is used to calculate the average neighbouring population;
- 100 kms is used as the cut-off parameter to define the proximity indicator;
- 5% of the sample (7 given our sample size of 144) is used to define the neighbouring region for the neighbouring air traffic potential.

A8.32 In the table directly below, we present sensitivity of our results to these choices. These results indicate that our results are robust to other reasonable choices for these hyperparameters.

Table A8.7 Sensitivities to hyperparameters in defining variables

	Effect on total employment (%)	Effect on industrial employment (%)	Effect on service employment (%)
Use the closest 10 region to define neighbouring population	0.13*** (0.09–0.19)	0.13*** (0.08–0.18)	0.13*** (0.09–0.19)
Use 150 kms as the cut-off point to define the proximity indicator	0.13*** (0.09–0.18)	0.12*** (0.08–0.18)	0.13*** (0.09–0.19)
Use 10% of the sample to define the neighbouring region	0.13*** (0.08–0.18)	0.12*** (0.08–0.17)	0.13*** (0.09–0.18)

Note: Values indicate the employment response to a 1% change in air traffic. Values in parentheses are the 95% confidence interval of the estimated response. (***) represent statistical significance at the 1% level.

Source: Oxera.

A8G Data sources

A8.33 Below are the data sources we have used to construct the county/unitary authority level dataset described in section A8C.

Table A8.8 Data sources

Label	Explanation	Source
Employment	2018 employment level in the industrial sector	NOMIS (2018), 'Annual Population Survey T11a Employment by age and industry (SIC 2007)', May.
Service employment	2018 employment level in the service sector excluding tourism	NOMIS (2018), 'Annual Population Survey T11a Employment by age and industry (SIC 2007)', May.
Industrial employment	2018 employment level	NOMIS (2018), 'Annual Population Survey T11a Employment by age and industry (SIC 2007)', May.
Number of air passengers	Total terminal and transit passengers	CAA (2018), 'Airport data Table 8 Air Passengers by Type and Nationality of Operator', April.
Population	2011 population level	Office for National Statistics, National Records of Scotland, Northern Ireland Statistics and Research Agency (2016), 2011 Census aggregate data. UK Data Service (Edition: June 2016).
Share of 65+	Share of population above 16 years old who are aged 65 and above	NOMIS (2018), 'Annual Population Survey T1 Economic activity by age', May.
Share of Q4+	Share of population aged between 16 and 64 with a Q4 equivalent education or above	NOMIS (2018), 'Annual Population Survey T19 Qualification by age - NVQ', May.
Geographical locations	Latitudes and longitudes of each county/unitary authority	ONS (2019), 'Local Authority Districts (December 2017) Full Clipped Boundaries in Great Britain', May.
Number of air passengers	Total terminal and transit passengers	CAA (2018), 'Airport data Table 8 Air Passengers by Type and Nationality of Operator', April.
Number of ATMs	Total number of aircraft movements	CAA (2018), 'Airport data Table 3 Aircraft Movements', April.

Source: Oxera.

A8H Airports and counties/unitary authorities used in the analysis

A8H.1 Counties/unitary authorities

Aberdeen City; Aberdeenshire; Angus; Argyll & Bute; Bath and North East Somerset UA; Bedford UA; Blackburn with Darwen UA; Blackpool UA; Blaenau Gwent; Bournemouth UA; Bracknell Forest UA; Bridgend; Brighton and Hove UA; Bristol, City of UA; Buckinghamshire; Caerphilly; Cambridgeshire; Cardiff; Carmarthenshire; Central Bedfordshire UA; Ceredigion; Cheshire East UA; Cheshire West and Chester UA; Clackmannanshire; Conwy; Cornwall UA; County Durham UA; Cumbria; Darlington UA; Denbighshire; Derby UA; Derbyshire; Devon; Dorset; Dumfries & Galloway; Dundee City; East Ayrshire; East Dunbartonshire; East Lothian; East Renfrewshire; East Riding of Yorkshire UA; East Sussex; Edinburgh, City of; Eilean Siar; Essex; Falkirk; Fife; Flintshire; Glasgow City; Gloucestershire; Greater Manchester (Met County); Gwynedd; Halton UA; Hampshire; Hartlepool UA; Herefordshire, County of UA; Hertfordshire; Highland; Inner London; Inverclyde; Isle of Anglesey; Isle of Wight UA; Kent; Kingston upon Hull City of UA; Lancashire; Leicester UA; Leicestershire; Lincolnshire; Luton UA; Medway UA; Merseyside (Met County); Merthyr Tydfil; Middlesbrough UA; Midlothian; Milton Keynes UA; Monmouthshire; Moray; Neath Port Talbot; Newport; Norfolk; North Ayrshire; North East Lincolnshire UA; North Lanarkshire; North Lincolnshire UA; North Somerset UA; North Yorkshire; Northamptonshire; Northumberland UA; Nottingham UA; Nottinghamshire; Orkney Islands; Outer London; Oxfordshire; Pembrokeshire; Perth & Kinross; Peterborough UA; Plymouth UA; Poole UA; Portsmouth UA; Powys; Reading UA; Redcar and Cleveland UA; Renfrewshire; Rhondda Cynon Taf; Rutland UA; Scottish Borders; Shetland Islands; Shropshire UA; Slough UA; Somerset; South Ayrshire; South Gloucestershire UA; South Lanarkshire; South Yorkshire (Met County); Southampton UA; Southend-on-Sea UA; Staffordshire; Stirling; Stockton-on-Tees UA; Stoke-on-Trent UA; Suffolk; Surrey; Swansea; Swindon UA; Telford and Wrekin UA; The Vale of Glamorgan; Thurrock UA; Torbay UA; Torfaen; Tyne and Wear (Met County); Warrington UA; Warwickshire; West Berkshire UA; West Dunbartonshire; West Lothian; West Midlands (Met County); West Sussex; West Yorkshire (Met County); Wiltshire UA; Windsor and Maidenhead UA; Wokingham UA; Worcestershire; Wrexham; York UA.

A8H.2 Airports

Table A8.9 Active airports and their regions in our data

Airport	Region	Airport	Region
Aberdeen	Aberdeen City	Kirkwall	Orkney Islands
Barra	Eilean Siar	Land's End (St. Just)	Cornwall UA
Benbecula	Eilean Siar	Leeds Bradford	West Yorkshire (Met County)
Birmingham	West Midlands (Met County)	Lerwick (Tingwall)	Shetland Islands
Blackpool	Blackpool UA	Liverpool (John Lennon)	Merseyside (Met County)
Bournemouth	Dorset	London City	Inner London
Bristol	Bristol, City of UA	Luton	Luton UA
Campbeltown	Argyll & Bute	Manchester	Greater Manchester (Met County)
Cardiff Wales	Cardiff	Newcastle	Tyne and Wear (Met county)
Doncaster Sheffield	South Yorkshire (Met County)	Newquay	Cornwall UA
Dundee	Dundee City	Norwich	Norfolk
Durham Tees Valley	Darlington UA	Prestwick	South Ayrshire
East Midlands International	Derby UA	Scatsta	Shetland Islands
Edinburgh	Edinburgh, City of	Southampton	Southampton UA
Exeter	Devon	Southend	Essex
Gatwick	West Sussex	Stansted	Essex
Glasgow	Glasgow City	Stornoway	Eilean Siar
Heathrow	Outer London	Sumburgh	Shetland Islands
Humberside	North Lincolnshire UA	Tiree	Argyll & Bute
Inverness	Highland	Wick John O'Groats	Highland
Islay	Argyll & Bute		

Source: Oxera.

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