Gatwick Airport Northern Runway Project

Explanatory Note on Catalytic Employment

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1 Introduction

1.1.1 This note presents the methodology used to estimate the impact of the Northern Runway Project ('NRP' or the Project) on total local employment (net of local displacement) due to the increase in air traffic generated by the Project. The total local employment impact expected from NRP refers to the sum of the direct, indirect, and induced impacts, which are calculated separately, but also the catalytic employment impacts derived directly from the methodology discussed here.

1.1.2 The purpose of this note is to cover the methodology used to calculate total employment (and thereby estimate catalytic employment); we therefore do not discuss explicitly the methodology used to calculate direct, indirect, and induced impacts generated by the Project. For more information on the assessment methodology for direct, indirect, and induced impacts, please refer to sections 5.2-5.5 in **ES Appendix 17.9.2: Local Economic Impact Assessment** [APP-200].

1.1.3 By way of an introduction to the approach used, the main output from this methodology is an elasticity. This method produces a percent relationship (or elasticity) between, on one side, increases in air traffic and, on the other, the resulting increases in local employment. This analysis suggests that a 1% increase in traffic at Gatwick would result in a 0.13% increase in local employment, a figure consistent with the academic literature that our approach replicates. Estimates in the literature range from 0.02% to 0.18%.[1]

2 Approach used to estimate local employment impacts

2.1 The need for an elasticity analysis

2.1.1 The purpose of the local economic impact assessment is to provide estimates of the economic impacts of the Project expressed in gross value added ('GVA')[2] and number of jobs that would be generated by the additional traffic and economic activity arising from the NRP in the local area[3] around Gatwick Airport.

[1] The lower range of elasticities corresponding to impacts on much smaller spatial scales (cities). The full list of academic literature references can be found in table A5.1 (Annex 5) of APP-200.
[2] GVA (gross value added) is a standard measure of economic activity routinely used by statistical agencies, such as the UK Office for National Statistics (ONS) and Eurostat, to measure an industry's contribution to the 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).
[3] In the assessment, this local area is defined as the Six Authorities Area and covers the county council areas of West Sussex, East Sussex, Surrey, and Kent as well as the Unitary Authority of Brighton and Hove, and the London Borough of Croydon.

2.1.2 In the scope of this type of assessment, it is usual to measure the economic footprint (i.e. the scale) of the activity that would be generated by the infrastructure project. This footprint would include:

- direct impacts (taking place on-site at the airport);
- indirect impacts (related to the supply-chain of direct activities);
- induced impacts (related to activity generated spending of employees in direct and indirect activities); and
- other wider impacts that would be generated in the local area (e.g. economic activity from the increased attractiveness of the local area due to the Project).

2.1.3 However, one usual challenge raised with this type of assessment is that it does not take account of the alternative uses of resources and people without the Project. That is to say that this assessment measures the scale of activities related to the Project, but does not account for the fact that, without that Project, these resources would have been mobilised elsewhere (i.e. they would have been displaced), such that the economic activity and the jobs measured are not necessarily net additional even at a local level (i.e. some of these impacts would have still occurred locally).

2.1.4 **The first reason for deploying the elasticity described in the introduction to this note is to address this displacement challenge** — as the total employment impact measured through this method captures employment net of displacement. It is therefore a conservative and more robust assessment of the local economic impact of NRP.

2.1.5 The Department for Transport's ('DfT') appraisal guidance (Transport Analysis Guidance or 'TAG') describes displacement as a key issue in wider economic impact assessments.[4] DfT points out that local economic impacts from transport schemes, such as higher levels of employment, are likely displaced from other locations unless they have a national impact on labour supply (through the additional available transport capacity). DfT suggests a national-level assessment is therefore a complementary approach to the local economic impact assessment to assess the scheme impacts.[5] In a similar way, HM Treasury's policy appraisal guidance (Green Book) presents a framework to assess place based impacts and recommends to adjust employment effects for leakage,

[4] Department for Transport (2019), 'TAG Unit A2.A - Wider Economic Impacts Appraisal', section 3.6. Available under : https://assets.publishing.service.gov.uk/media/5fc8b4bdd3bf7f7f52707867/tag-a2-1-wider-economic-impacts-appraisal.pdf
[5] A TAG-compliant national cost-benefit analysis of the scheme was also undertaken in the context of the DCO application, and submitted as APP-251 '7.2 Needs Case Appendix 1 – National Economic Impact Assessment'. Available under: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR020005/TR020005-001045-7.2%20Needs%20Case%20Appendix%201%20-%20National%20Economic%20Impact%20Assessment.pdf

substitution, and displacement.[6] The academic literature focused on measuring displacement suggests that this effect could represent around 20%-30% of net employment gains at a regional level.[7]

2.1.6 This guidance suggests that an analysis that takes into account displacement, albeit at a local level as described here, would be helpful to inform local authorities about the extent to which they can expect to be impacted in net terms by the Project.

2.1.7 **The second reason is to identify a relationship between local employment and traffic that is causal.** By causal, we mean that we are seeking to measure the impact that higher traffic at Gatwick due to the NRP would have on the local economy. Therefore, any analysis must focus on the additional economic activity that is caused by the additional traffic, excluding as much as possible other (irrelevant) factors that would also lead to higher employment.

2.1.8 Causality is also an important aspect of the analysis of wider economic impacts. The purpose of this assessment is to measure the employment impact that this additional traffic would generate locally, excluding other factors that would also affect employment. In **Needs Case Appendix 2 – The Economic Impact of Gatwick Airport: A Report by Oxford Economics** [APP-252], Oxford Economics also uses statistical techniques to derive the impact of additional connectivity at Gatwick Airport on productivity.[8] While the method used to derive an impact by Oxford Economics is different from the methodology described here, it is relevant to note that the analytical issue it was trying to resolve (establishing causality between indicators that have a two-way relationship) is the same as explained below. Oxford Economics used a similar approach to estimating the impacts of the proposed expansion of Luton Airport. More widely, academic literature in transport economics typically aims to address this causality issue.[9] A meta-study by Melo, Graham, and Brage-Ardao[10] on transport infrastructure impacts comments that estimates from the 1990s of the scale of

[6] HM Treasury (2022), 'Green Book – A2 Place Based Analysis'. Available under : https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020#a2-place-based-analysis
[7] For example, please refer to Homes & Communities Agency (2014), 'Additionality guide – Fourth Edition 2014' available here: https://assets.publishing.service.gov.uk/media/5a7ec4b9e5274a2e87db1c92/additionality_guide_2014_full.pdf; or E. Einiö and H.G. Overman (2016), 'The (Displacement) Effects of Spatially Targeted Enterprise Initiatives: Evidence from UK LEGI', available here: https://cep.lse.ac.uk/pubs/download/sercdp0191.pdf; LE Wales (2006), 'The Economic Impact of Large-Scale Investments in Physical and Intellectual Infrastructure - A Review of International Evidence', available under: https://www.gov.wales/sites/default/files/statistics-and-research/2018-12/081106-impact-investments-physical-intellectual-infrastructure-en.pdf
[8] Please refer to paras. A.1.29-A.1.33 in APP-252.
[9] G.S. Mishra, P.L. Mokhtarian, R.R. Clewlow, and K.F. Widaman, 2019. "Addressing the joint occurrence of self-selection and simultaneity biases in the estimation of program effects based on cross-sectional observational surveys: case study of travel behavior effects in carsharing" Transportation, Springer, vol. 46(1), pages 95-123, February. The paper separates out the simultaneity bias, and shows it accounts for 40% of the impact measured of carsharing on travel behaviour.
[10] Patricia C. Melo, Daniel J. Graham, Ruben Brage-Ardao, The productivity of transport infrastructure investment: A meta-analysis of empirical evidence, Regional Science and Urban Economics, Volume 43, Issue 5, 2013, Pages 695-706, ISSN 0166-0462,

relationship between transport and economic growth suffered from model misspecification and spurious relationships, which more recent assessments are designed to address. One such example is a transport economics paper by Makhtarian et al, which found that this issue, if unaccounted for, leads to policy impact overestimates of up to 40%.

2.1.9 To address only the first issue (displacement), we could have simply compared changes in air traffic at Gatwick in the last 5-10 years against changes in local employment during this same period. This simple approach would have produced a net impact at a local level. However, we have not done so for two main reasons related to the second issue (causality) as outlined below.

- **Non-traffic related employment –** There are factors that drive increases in employment locally other than increases in traffic at Gatwick Airport (e.g. population increases). This basic approach would wrongly attribute to Gatwick Airport all increases in local employment without accounting for these other factors – and thereby potentially overestimate the impact of air traffic.
- **Increase in employment causing air traffic –** This basic approach does not establish whether air traffic caused the increase in employment or the opposite (i.e. which way the causal relationship goes). For example, if local employment increases for non-traffic related reasons (e.g. population increases) and this increase in employment generates additional traffic (e.g. more business passengers), then this basic approach would wrongly attribute the impact of employment on air traffic instead of the opposite – and thereby overestimate the impact of air traffic.

2.1.10 The approach we have chosen therefore addresses both issues of displacement and causality, providing a robust estimate of the magnitude of the economic impact of NRP that can be expected to occur locally. We discuss this methodology in more detail below, explaining why the resulting relationship is both causal and net of displacement.

2.2 Elasticity methodology

2.2.1 Our analysis produces an elasticity that is applied to the traffic increase predicted to arise due to the NRP, in order to provide estimates of the total employment impact expected to occur as a result of the Project.

2.2.2 To address the two issues (displacement and causality) outlined above, we have chosen to take an approach used in the academic literature, called a **two-stage**

least squares analysis.[11] This approach is a well-known statistical technique used in economics and other fields such as epidemiology to circumvent the challenges related to causality (i.e. two-way relationship between air traffic and employment described above). The elasticity is also net of local displacement, as it measures the change in total employment at a local level – i.e. job switching within the area would not change total employment at the level of that local area, and would therefore have no impact on the measured relationship.

2.2.3 This approach uses air traffic data from all major commercial UK airports for year 2018[12] and employment data at the level of the county/unitary authority (UA) throughout the UK (e.g. West Sussex where Gatwick Airport is located).[13] This is called a cross-sectional analysis as the elasticity we estimate is derived from the average relationship between the scale of air traffic and local employment across the UK (as opposed to across time).

2.2.4 As this analysis replicates peer-reviewed academic studies undertaken in Italy and the US,[14] we have been able to use the same type of variables these papers included in their analytical framework in our assessment.

2.2.5 This approach is called a 'two-stage least squares analysis' as it is applied in two steps.

- **In step 1**, for each UK county/UA, the demographic characteristics of the area (i.e. population, education levels, etc.) and location indicators (closeness to GB population centre, and proximity to large UK airports) are used to predict traffic potential. This step amounts to answering the question: **given the characteristics of a given area, what would be the predicted level of traffic provided an airport were to operate there?**

  In this methodology, this step is conceptual. By conceptual, we mean that it does not produce an output that is interpretable (e.g. cannot be compared to actual data on passenger numbers),[15] but its aim is to solve the statistical issue that has been identified. This step is used to replace a problematic variable (air traffic in this case, which suffers from the causality issue) with a

[11] Also known in statistics as instrumental variable estimation.
[12] This assessment was undertaken in 2019 and was not updated since due to the likely impact of the COVID-19 pandemic on the results.
[13] The county/UA geographic scale has been chosen as it is wide enough to cover a sufficient share of the employment impact that are likely to be generated by the airport (as opposed to the local authority which would be too narrow), but not too wide that it would be challenging to estimate the relationship between traffic and employment (as opposed to the region-level which is too large to be meaningfully impacted by traffic only)
[14] Percoco, M. (2010), 'Airport Activity and Local Development: Evidence from Italy, Urban Studies, 47:11, September, pp. 2427–2443. Brueckner, J.K. (2003), 'Airline Traffic and Urban Economic Development', Urban Studies, 40:8, July, pp. 1455–1469
[15] By interpretable, we mean that it is not expected that the output of this step in the assessment can be interpreted directly or benchmarked. It is an intermediary step to the objective of the assessment—i.e. producing the elasticity estimate.

synthetic replacement (called 'air traffic potential'), which is correlated with the problematic variable sufficiently to replace it, but doesn't suffer from the same issue.
This air traffic potential is calculated for each county/UA in the UK in two sub-steps:

- estimate the relationship between actual air traffic using data from all existing UK airports and demographic/location characteristics for the counties/UAs in which they are located;
- apply this relationship to demographic/location characteristics for each UK county/UA (both those that have and those that do not have an active airport) to estimate air traffic potential for all geographic areas in the UK.

Concretely, this air traffic potential variable therefore corresponds to the passenger traffic that would occur in each county or UA in the UK provided an airport started to operate from there. It is a synthetic measure of the scale of airport activity (i.e. how large the airport would be), considering where the airport would be located in the UK.

- **In step 2**, the air traffic potential for each county/UA predicted in step 1 is then used to estimate the elasticity of interest. That is to say that the output of step 1 becomes an input in the second stage analysis to calculate the relationship between air traffic (now defined as air traffic potential) and local employment. The analysis also uses data on the demographic characteristics of the area to control for other relevant factors. This step amounts to answering the question: **given the scale of potential airport traffic in a given geography, what is the expected level of employment?**

  This step is a simple linear relationship between the synthetic input and the local employment. However, using the air traffic potential from step 1 ensures that the resulting elasticity does not overestimate the impact of air traffic on employment.

2.2.6 The output of this assessment indicates that that a 1% increase in traffic at Gatwick would result in a 0.13% increase in local employment.

2.3 Estimation of employment impacts, including catalytic impacts

2.3.1 Using the elasticity estimated using the approach detailed above, we calculate the total employment generated by the NRP at the county (West Sussex) level.

This is set out in Table 1.1 of **ES Appendix 17.9.2: Local Economic Impact Assessment** [APP-200].

2.3.2 To do so, the 0.13 figure is applied to forecast increases in air traffic at Gatwick Airport arising from the NRP, to calculate percent increases in local employment. This percent increase is then multiplied to the forecast total employment in West Sussex to derive the increase in local employment. As the resulting total net employment figure represents the sum of all Project-generated employment, other impacts (direct, indirect, and induced at the local level) are removed from the total to calculate the catalytic employment.

2.3.3 At this stage, the scale of impacts measured is at the West Sussex county level – in line with the geographic scope of the elasticity analysis. The county definition used in the elasticity analysis is an artificial but relevant boundary used to systematically define a local area around each UK airport. The analysis provides a robust estimate of the scale of impacts associated with an increase in traffic at Gatwick Airport, but realistically this impact is unlikely to be limited to the county of West Sussex (in part because of how close the airport is to the county boundary). We therefore assume that the estimated employment impact will be distributed throughout the Six Authorities Area.[16] This assumption is conservative, as it is expected that the magnitude of impacts at a Six Authorities Area level would be larger than those at the West Sussex level, but this assumption reflects more accurately the expected geographic distribution of NRP-generated employment impacts.

2.3.4 As a result, this analysis suggests that by 2047 the Project would support 12,800 jobs in the Six Authorities Area, including 6,400 direct/indirect/induced jobs combined and 6,500 catalytic jobs.

3 Feedback received from local authorities' advisors on the approach

3.1.1 This methodology has been discussed with local authorities and their advisors in the context of Topic Working Groups ('TWG'). They have shared some comments and asked clarification questions on the approach.

3.1.2 In particular, York Aviation has expressed concerns over different aspects of the assessment including two main concerns on:

[16] The study area comprises the County Council areas of East Sussex, West Sussex, Surrey, Kent and Brighton & Hove (unitary authority) and the London Borough of Croydon.

- the use of a statistical approach instead of survey data; and
- the analysis not being focused on local demand for airport services.

3.1.3 We discuss these two concerns below.

3.2 Use of a statistical approach

3.2.1 York Aviation challenged the need to use a statistical analysis to measure local employment impacts, and suggested that survey data could have been used instead. CAA passenger survey data[17] was provided as an example of a dataset that could have been used to inform the analysis, instead of requiring a statistical approach.

3.2.2 In response to this point, we noted that CAA passenger survey data is a reasonable source in general to understand airport catchment areas. The data includes granular information about where passengers travelling through a specific airport come from within the UK. This data is also available by journey purpose, such that it is possible to differentiate between leisure and business passengers. With this type of data, it is possible to identify the local demand for Gatwick Airport from business passengers – which would in part drive catalytic employment impacts, for example.

3.2.3 It is not possible however to separate out the share of this demand that is stimulated by airport activity from the share that itself stimulates airport activity (issue 2 of causality). It would also not be possible to determine to what extent part of this demand would occur even absent the Project (issue 1 of displacement). Therefore, the York Aviation approach would suffer from the biases we highlight above, potentially leading to over-estimates of the impact of the NRP on employment.

3.2.4 However, as a test to the conceptual assessment made, we estimated an elasticity directly on the basis of actual data on air traffic[18] (instead of air traffic potential), keeping the same control factors used in the two-step analysis, i.e. omitting step 1 altogether. This approach does not use the CAA survey data suggested by York Aviation, which is incompatible with the approach we are

[17] For an extract of the CAA passenger survey, please refer to the CAA's website here : [redacted]

[18] The air traffic data used in this simpler approach is the same variable used in the first step of the two-step approach, which is the CAA (2018) total number of terminal and transit passengers for each UK airport. This dataset, which is also sourced from the CAA, lists for each UK airport the number of passengers that travelled through it in 2018 and is used in step 1 of the analysis described in section 2.2 of this note. It differs from the CAA passenger survey dataset to which York Aviation referred to, as it does not include information on the geographic distribution of passengers (i.e. which local authority / county they travel to or from within the UK to reach the airport). The CAA traffic data used for this test assessment suffers from the same causality issue highlighted for the CAA passenger survey data, as it is not possible to separate out the share of traffic that is stimulated by local employment from the share that itself stimulates local employment.

following based on the existing literature.[19] However, this test is useful as it checks whether, as per our initial assessment, applying just step 2 would result in overestimating the impact. The results indicate that that a 1% increase in traffic would result in a 0.17% increase in local employment, higher than our estimate of 0.13% from the two-step approach. This result, which was shared with York Aviation, confirms the initial theoretical assessment made that a simpler approach would likely overestimate the impact of air traffic on local employment. Using the 0.17% estimate, the catalytic employment footprint in 2047 would be 8,900 jobs (instead of 6,500 jobs in the DCO assessment).[20]

3.3 Assessment based on throughput, not local demand

3.3.1 York Aviation also challenged the nature of the approach, which focuses on the relationship between the scale of airport activity (i.e. level of total traffic) and local employment. Instead, it was suggested that focusing on local demand for airport services would have been more appropriate to measure specifically the catalytic impact of the Project.

3.3.2 In a TWG meeting dated 14 June 2024, it was for instance suggested that the elasticity assessment could have been redesigned to measure specifically the impact of local demand for business passenger services on the level of catalytic economic impacts generated around the airport.

3.3.3 It is acknowledged that an analysis of this type may allow the measurement of the catalytic footprint of the NRP. However, there are a number of issues with this type of approach including the two important concerns listed below.

- It would be challenging to implement. One would, for instance, need not only to define an airport catchment area for each UK airport (i.e. the list of local areas from which the airport derives most of its demand), but also for counties in which there is currently no airport to reproduce the analytical framework that was implemented. It would also need to get data on baseline catalytic employment for all such catchment areas which would require to determine the types of local employment that can be identified as catalytic employment and do this exercise for each catchment area in the UK.

[19] Using the CAA passenger survey data is not possible within this analytical framework as this methodology focuses on the relationship between airport traffic (i.e. the number of passengers that travelled through an airport) and local employment. The assessment does not consider the impact of local demand which is measured by the CAA passenger survey data, and taking local demand into account within this type of framework would require to materially change the methodology used and raise other issues as discussed in section 3.2 which follows.

[20] It should also be noted, however, that the elasticity produced using this simpler approach relies on very few observations (33 observations based on the data available, instead of 144 in the two-step approach (which benefits from the estimated observations for counties without airports) and suffers from those critical statistical shortcomings highlighted in support of our approach. It would no longer be possible to interpret this estimate as the causal impact of an increase in air traffic (as the scheme would generate) on local employment.

- It may address causality (issue 2) but not displacement (issue 1). This type of analysis would necessarily emphasise catalytic employment, and thus replacing total local employment as a variable from the elasticity analysis with a measure of catalytic employment specifically. However, to the extent that job-holders may switch between different categories of employment (from jobs unrelated to catalytic employment to jobs related to catalytic employment), these displacement impacts would not be captured by the analysis. Only an analysis of total employment impacts could address the displacement.

3.3.4 On the basis of the points above, it was determined that amending the existing assessment to undertake the suggested analysis would not be proportionate given the substantial amount of work required to identify and prepare the data necessary to do this assessment and check that the analytical framework is applied with sufficient robustness.

4 Conclusions

4.1.1 To summarise, a statistical approach was used to identify the magnitude of the total impact on employment from the NRP.

4.1.2 This statistical approach was chosen as a way to address two challenges related to this type of assessment: displacement (i.e. some of these jobs would exist locally even absent NRP) and causality (i.e. the impact should be specific to employment generated by additional airport activity, not the opposite). These challenges, left unaddressed, would create major over-estimates of the impact on local employment of the increase in traffic arising from the NRP.

4.1.3 This methodology replicates peer-reviewed research with UK data and gives results (1% increase in traffic lead to a 0.13% increase in local employment), which are very much in line with results from the literature ranging from 0.02% to 0.18%.[21]

4.1.4 Applied in the context of this assessment, these results produce estimates that are conservative compared to benchmark estimates. Oxford Economics presents alternative estimates for direct/indirect/induced impacts generated by NRP by

[21] The lower end of the range of estimates corresponds to impacts at smaller spatial scales (0.02% at the scale of Italian cities in Percoco).

2047, totalling an additional 8,200 jobs in the Six Authorities Area[22] (compared to the Oxera estimates of 6,400).

4.1.5 While Oxford Economics does not produce estimates for the catalytic employment impact at the level of the Six Authorities Area, it can be noted that the UK-level tourism and trade impacts of NRP estimated by Oxford Economics are referred to as catalytic impacts. These two catalytic impacts are estimated as 52,800 jobs by 2047.[23] The Oxera catalytic impact estimate of 6,500 jobs corresponds therefore to less than 15% of this UK total. As catalytic impacts are location-based (i.e. the closer to the airport the area is located, the larger the expected impact), a 15% share of catalytic impacts being located in the Six Authorities Area represents a modest share – further suggesting that the local catalytic impact estimate in Oxera's analysis is conservative.

4.1.6 These points above would indicate that the Oxera estimates used to inform the assessment of socio-economic impacts from NRP are robust and conservative, such that the local economic benefits of the Project are not overstated.

4.1.7 The analysis presented therefore benefits from rigorous academic foundations, overcoming usual analytical challenges raised by the assessment of local economic impacts of infrastructure projects, and results from this analysis are very much in line with those from the associated literature. They are also consistent with those produced from alternative assessment methodologies such as the approach used by Oxford Economics.

[22] Please refer to Table A-6 in APP-252, the total of 8,200 jobs corresponds to the sum of the incremental jobs generated by NRP over the Base case in the Six Authorities Area as reported in parenthesis in the table.
[23] Please refer to Table A-8 and Table A-9 in APP-252.