

# Assessment of the value of air freight services to the UK economy

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Prepared by:

Steer  
28-32 Upper Ground  
London SE1 9PD  
  
+44 20 7910 5000  
[www.steergroup.com](http://www.steergroup.com)

Prepared for:

Airlines UK  
25 Southampton Buildings  
London  
WC2A 1AL  
Client ref:  
Our ref: 23348601

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## Executive Summary

### Background

This study has been produced by Steer for Airlines UK with support from Heathrow Airport Limited, Manchester Airports Group and the Freight Transport Association. It has been undertaken in the context of the UK Government developing its Aviation Strategy, due for publication in Summer 2019, with a Green Paper expected in December 2018. As part of this process, the Government is consulting stakeholders to identify barriers to growth and how to reduce them. While many high value-added industries make significant use of air freight, there remains limited understanding of the role of air freight within the UK economy. The purpose of this study is to assess and quantify the value of the air freight industry to the UK economy, and in particular, its importance to UK regions, international trade and industrial sectors.

### Key figures

- Air freight services contribute £7.2 billion to the UK economy and support 151,000 jobs.
- Across all sectors of the economy, £87.3 billion of UK gross value added (GVA) is currently dependent on air freight exports, including a very significant proportion of the GVA of some key industries and their supply chains:
  - Pharmaceuticals - £13.9 billion
  - Computer, electronic & optical - £8.3 billion
  - Creative arts & entertainment - £5.3 billion.
- In 2017 air freight represented 49% of the UK's non-EU exports by value (£91.5 billion) and 35% of non-EU imports (£89.9 billion) - over 40% of total trade by value but under 1% by volume of goods shipped.
- Germany ships just 25% of its non-EU export value by air, and most other major EU economies ship between 20% and 40%. Only Ireland ships a greater share of its non-EU exports by air than the UK.
- 9% of GVA in the North West (worth 14.9bn) is currently dependent on air freight services, compared to less than 2% of London's output. Figures are 8.6% in Wales, 7.6% in the East Midlands and 6.8% in the South West.

### Industry structure

The air freight industry is complex and highly fragmented. The four major sub-markets within air freight are General cargo, Express, Specialist and niche products and Mail. Although the industry is complex and business models overlap, two principal business models serve all four markets; the forwarder model and the integrator model.

These business models dominate the UK's major air freight airports: Heathrow, East Midlands, Stansted and Manchester. Heathrow is by far the largest general air freight market using the forwarder business model and the overwhelming majority of cargo is transported in the bellyhold of passenger aircraft, mostly on long-haul routes. East Midlands, by contrast, is dominated by express freight using the integrator business model, with freight carried in freighter aircraft, often overnight on routes to mainland Europe, but also on intercontinental routes. Stansted has a combination of integrators and other freighters, while Manchester is largely bellyhold, although on a much smaller scale than Heathrow.

One notable feature of the UK air freight market is the huge importance of Heathrow and its surrounding freight facilities, with most forwarders having major consolidation centres in the vicinity of the airport. Very significant volumes of air freight are trucked to such facilities near Heathrow, processed and then trucked to another airport, either in the UK or in continental Europe, without ever flying in or out of Heathrow itself.

Night operating restrictions, based on movement limit and noise quota systems, are currently in place at Heathrow, Gatwick and Stansted, while other airports have to produce noise action plans which may set out operating limits for the night period. There is also an additional noise quota limit incentivising the user of quieter aircraft.

The quality of the UK's air freight infrastructure is a major issue, with freight facilities at UK airports often being decades old and having suffered from continued under-investment. While other airports are not as slot congested as Heathrow, they now cater to significantly more widebody freight capacity than the facilities were originally designed for.

Although the terms of the UK's exit from the EU are still being negotiated, withdrawal from the EU has the potential to affect the UK freight industry through changes to customs arrangements and changes to air services agreements (ASAs).

This analysis of the structure of the air freight industry raises a number of issues relevant to the formulation of national aviation policy. These include:

- the positive and negative aspects of the concentration of the air freight industry at and around Heathrow;
- the quality of infrastructure supporting air freight services;
- the balance of the impacts of night and noise restrictions on local residents and air freight services;
- the potential for growth of air freight services at airports outside the South East of England; and
- the management of the potential impacts of Brexit.

## **Market Analysis**

Bellyhold cargo at Heathrow accounted for over 60% of total UK air freight volume in 2017, with forwarders and shippers utilising its extensive intercontinental passenger network. Over 30% of total air freight was shipped on US routes and most of the remainder on Asian routes. Freighter and integrator cargo is concentrated at East Midlands and Stansted, which, in 2017, together accounted for over 20% of all UK freight and the majority of freighter (60%) and integrator (79%) activity. Integrators accounted for over 90% of freight at East Midlands. At Stansted, integrators FedEx and UPS were the largest cargo airlines, although intercontinental freighters such as Qatar Airways, Cargolux and China Southern also accounted for a large share of volume.

In the last 15 years, aside from the decline in 2009 due to the fallout from the financial crisis, total volumes have remained relatively flat, growing with a compound average growth rate (CAGR) of +1.2% over the 15-year period with volumes only surpassing the pre-crisis peak in 2016.

North America was the largest destination market (accounting for 32% of volume), followed by Europe (25%, 18% of which was to the EU) and, South and East Asia (19%). Heathrow, and to a lesser extent Gatwick, handled predominately North American and Asian freight, benefitting from extensive passenger networks. The large European share of volume at East Midlands

reflects the airport's role within its integrators' networks. Similarly, at Stansted, much of the freight volume is on European and North American routes.

A relatively large share of many regional airports' volume (including Manchester, Birmingham, Glasgow and Newcastle) is accounted for by Middle Eastern routes, reflecting the importance of the Gulf carriers' networks to these airports' freight operations. Airports in Scotland and Northern Ireland, such as Aberdeen, Belfast and Edinburgh, have a relatively large share of domestic volumes, which is likely to be because trucking to other parts of the UK from these locations is less time-effective.

Although Heathrow is one the largest airports in the EU in terms of freight volumes, due to its slot and operating constraints described above, it has a significantly lower amount of freighter activity compared to other major European hub airports.

As air freight has started to grow again after several years of stagnation, the increasing volumes and longhaul connections at major airports outside the South East of England as well as the prospect of the third runway bringing additional capacity at Heathrow, give rise to a number of policy issues for consideration, including:

- how to make best use of existing infrastructure and unlock more capacity through investment in air freight facilities at UK airports;
- how to manage the air freight implications of the third runway at Heathrow; and
- how to support the air freight sector to grow sustainably.

### **International Trade**

In 2017, non-EU trade classified as being transported by air accounted for over 40% in terms of value but under 1% of total trade in volume terms (with sea accounting for over 98%). Air freight represented 49% by value of non-EU exports (£91.5 billion) and 35% by value of non-EU imports (£89.9 billion).

Many of the products with a high share of UK trade value transported by air, such as aircraft engine parts and power generating machinery, have a high share of both import and export value, likely reflecting the global nature of these industries' supply chains and manufacturing processes. One exception is pharmaceuticals, which account for a significant proportion of export (but not import) value.

It is also interesting to compare the UK's use of air freight for its exports and imports against other European countries. Although Germany is by far the largest EU exporter to non-EU countries, only 25% of its goods by value are transported by air, whereas the UK, which has the second largest total export market, ships a far higher proportion (49% by value) by air. Most of the other major EU economies ship between 20% and 40% of the value of their non-EU exports by air; only Ireland (64%) ships a greater share of its non-EU exports by air than the UK.

On the import side, the UK is the second largest market in the EU and has the highest share of imports transported by air, which makes its imports by air (£90 billion) the most valuable in the EU. Like the UK, most other major European economies ship lower proportion of their non-EU imports (compared to exports) by air, with most importing 10% to 30% by air in value terms.

The importance of air freight to UK international trade, and in particular the UK's higher dependence on air freight than most other countries raises issues for consideration in the

development of the UK Government's Aviation Strategy on the appropriate level of Government support for the air freight sector and how its importance should be reflected as part of the strategy for the aviation sector as a whole.

### Economic analysis

We have used two different, complementary, approaches to assessing the economic value of air freight:

- the traditional measure of economic impacts on employment, income and GVA of the air freight industry and associated services, generally known as “direct”, “indirect” and “induced” impacts (based on the activity in the sector itself and on upstream monetary flows between the air freight industry and other sectors in the economy); and
- the wider economic impacts of air freight, sometimes referred to as “catalytic impacts”, which consider how air freight facilitates economic activity in other sectors (based, in this case, on estimating what proportion of GVA in those sectors is currently reliant on air freight services).

Using the traditional approach, we have estimated the “direct”, “indirect” and “induced” impacts using a recognised methodology based on the use of Input-Output tables (I-O tables), produced by the Office for National Statistics (ONS). Direct impacts relate to the employment, income and GVA generated by the sector itself, indirect impacts take account of the knock-on effects in the sector's supply chain, while induced impacts also include the impacts of employees' spending in the economy. These can be calculated from the I-O table, by inspection for direct impacts and via standard techniques for the indirect and induced impacts.

Including all of these impacts, we estimate that air freight services support GVA of **£7.2 billion**, **151,000** jobs and associated income of **£4.1 billion** (2014 data and prices).

Note that this result only relates to activities and expenditure either within the air freight and supporting industries, its supply chain and spending by its workforce. It does not include “downstream” effects, i.e. the effect on the industries purchasing air freight services, or the wider, catalytic, impacts on the whole economy. To estimate these, we have used an approach based on the fact that supplying air freight services does not fully represent either the value of what is being flown, or the value of timely delivery. In terms of the value of what is flown, air freight imports and exports, between them, were worth £181 billion (2017 values and prices), or close to 25 times more than the economic added value (GVA) calculated using the direct, indirect and induced methodology described above.

Each sector of the economy produces outputs for which customers are willing to pay, with primary and secondary sectors producing physical products such as food, machine parts, cars and so on. For these sectors of the economy, their outputs equate to particular commodities so that, for example, farms produce agricultural products while automotive plants produce cars and trucks. Hence, there is a correspondence between each industry and its outputs. By using this correspondence (together with information on exports by air from HMRC, and in comparison with output from ONS), we can establish, for each industry producing physical outputs, what proportion of those outputs is represented by exports transported using air freight services.

It is reasonable to make the assumption that all output contributes equally to the GVA generated by an industry. We have also made the assumption that the proportion of an industry's GVA supported by air freight services is equal to the proportion of its outputs which

are exported by air. The final step in this analysis is to recognise that, if a portion of an industry's GVA is dependent on air freight services, then the suppliers who provide inputs to that industry are also dependent on the air freight services.

Using this approach, we have estimated the level of GVA currently dependent on air freight across the economy. Across all sectors of the economy, **£87.3 billion of GVA is currently dependent on air freight exports**. This represents **5% of the total GVA measure of national output** (£1,747 billion in 2016).

While the level of GVA currently dependent on air freight might potentially be reduced through the use of alternative modes of transport, the fact that such alternatives are generally poor substitutes for air freight, which is both much faster and much more expensive than surface freight, indicates that the level of GVA dependent on air freight is likely to remain significant. This indicates that air freight is a very important service supporting a significant fraction of national economic activity.

The analysis of the level of industries' and their supply chains' added value (GVA) which is currently dependent on air freight, enables us to estimate the regional importance of air freight services, by considering the regional distribution of output for each industry.

This analysis demonstrates the importance of the air freight industry in the North West, where £14.9 billion of GVA is currently dependent on air freight, representing 9.0% of the whole economy of the region. Similarly, air freight supports very significant proportions of economic activity in many regions, including 8.6% in Wales, 7.6% in the East Midlands, 6.8% in the South West, 6.0% in the West Midlands and 5.9% in Northern Ireland. The contrast between the very important role of Heathrow in providing air freight services, compared with the high dependence of regions away from the South East economies on air freight, is stark.

Considering both the industry structure and this economic analysis raises particular issues relevant to the formulation of national aviation policy as the UK Government develops an aviation strategy towards 2050:

- how to protect and develop the significant share of the UK economy currently dependent on air freight services; and
- how to support UK regions and nations whose economies are heavily dependent on air freight services, particularly where local airports do not currently benefit from strong air freight services.

# 1 Introduction

## Background

- 1.1 This study has been produced by Steer for Airlines UK with support from Heathrow Airport Limited, Manchester Airports Group and the Freight Transport Association. It has been undertaken in the context of the UK Government developing its Aviation Strategy, due for publication in Summer 2019, with a Green Paper expected in December 2018. As part of this process, the Government is consulting stakeholders to identify barriers to growth and how to reduce them. While many high value-added industries make significant use of air freight, there remains limited understanding of the role of air freight within the UK economy. The purpose of this study is to assess and quantify the value of the air freight industry to the UK economy, and in particular, its importance to UK regions, international trade and industrial sectors.

## Our Approach

- 1.2 To undertake this assessment, we have undertaken a review of the available literature, with data and information gathered from the following sources:
- The Civil Aviation Authority (CAA);
  - The Department for Transport (DfT);
  - Her Majesty's Revenue and Customs (HMRC);
  - The Office of National Statistics (ONS);
  - Eurostat;
  - The Official Airline Guide (OAG);
  - The United Nations Statistical Division (UNSD); and
  - Individual airport traffic statistical releases.
- 1.3 In addition, we have held interviews and received data from industry stakeholders, including:
- Passenger airlines (UK and foreign);
  - Integrators;
  - Cargo airlines;
  - Airport operators;
  - Freight industry trade bodies; and
  - UK-based companies using air freight.

## This Report

- 1.4 The remainder of this report is structured as follows:
- Chapter 2 gives an overview of the air freight industry in relation to markets, business models and constraints;
  - Chapter 3 describes the UK freight industry in relation to freight volumes;
  - Chapter 4 describes air freight's role in international trade; and
  - Chapter 5 provides a quantification of the economic contribution of air freight.
- 1.5 Illustrative case studies have also been provided in the text.

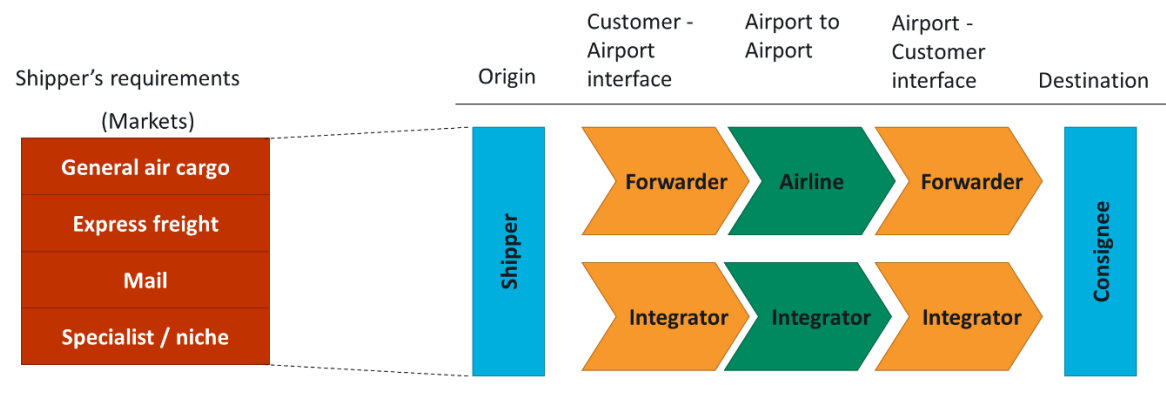
## 2 Industry structure

- 2.1 In this chapter we provide an overview of the major sub-markets within air freight, the primary business models serving them and the interaction between industry actors. The end of the chapter also provides a description of the current constraints within the UK market, based on information and views provided by stakeholders.

### Overview

- 2.2 The air freight industry is complex and – at some levels – highly fragmented. The organisation which operates the aircraft is often not the same organisation with which the shipper has made a contract – airlines rarely interact directly with the ultimate customer (the shipper). The four major sub-markets within air freight that we have identified are:
- General cargo;
  - Express;
  - Specialist and niche products; and
  - Mail.
- 2.3 The products offered within each sub-market are generally driven by customer requirements, which may include (but are not limited to): cost, speed, predictability, storage requirements and shipping regulations.
- 2.4 Although the industry is complex and business models overlap, two principal business models serve all four markets; the forwarder model and the integrator model. Over the last thirty years, these two types of service providers have significantly increased their product range, coverage and scale of operation, to the point where they now serve almost every market.
- 2.5 Integrators traditionally offered a worldwide courier product for documents and parcels, but now offer a range of products and geographies which compete at some level with every logistics provider in the supply chain. The forwarders, partly in response and partly in search of higher yields, have expanded their product range to include greater international coverage, door to door products and other logistic services.
- 2.6 The interaction between the four sub-markets and these two business models is illustrated in Figure 2.1 below.

Figure 2.1: Typical end to end journey: interaction between markets and business models



2.7 In the remainder of this chapter we provide, in turn, a more detailed description of the air freight sub-markets and business models.

**Air freight markets**

**General air cargo**

2.8 General air cargo forms the majority of air freight being shipped to and from the UK and is shipped predominately using passenger bellyhold capacity. General cargo is the standard core product offered by most freight-carrying airlines and therefore consists of a broad range of goods. The main carriers of general cargo in the UK are therefore IAG Cargo (British Airways and IAG group airlines), Virgin Atlantic and a number of foreign (predominately American and Asian) passenger airlines flying on long-haul routes, split approximately 40:60 in terms of volumes flown.

2.9 End-customer relationships are generally owned by freight forwarders, who act as intermediaries between shippers and airlines. Freight forwarders will often maintain relationships, possibly on a tendered basis, with a range of shippers, many of whom will have a requirement to send large volumes of freight on a regular basis.

**Express freight**

2.10 Although air freight is, by its nature, time-critical, express freight services are used when particularly rapid delivery is required and are generally sold on the premise of a guaranteed delivery slot. As well as a guaranteed delivery time, customers are also often able to track a shipment's progress, enabling them to have up-to-date information on geographical position, estimated time of delivery, details of any delays and revised delivery times.

2.11 The international express market is dominated by the four main integrators (DHL, FedEx, TNT (now a subsidiary FedEx)) and UPS), who carry freight on a mixture of their own aircraft and purchased bellyhold capacity. Integrators use their own aircraft within Europe and on high-volume long-haul routes, and purchase bellyhold capacity on lower volume long-haul routes where they do not operate their own aircraft.

2.12 Although business-to-business (B2B) activity still accounts for much of express freight volumes (for example on just in time supply chains), the growth of E-Commerce has increased the demand for business-to-consumer (B2C) services. This has, to some extent, changed the dynamic of express air freight services as a growing share of express demand is now driven by consumer expectation of fast delivery.

### Specialist and niche cargo

2.13 In addition to speed, some cargo shipments have requirements that cannot be met by general air cargo due to specific storage, security or regulatory requirements. Some of this cargo, such as perishable foodstuffs or pharmaceuticals, can be shipped as bellyhold freight but will usually require specialist containers and packaging. In some cases, it may also require specially trained staff or additional paperwork.

2.14 Other types of specialist cargo, such as dangerous goods, are not permitted to be carried on passenger aircraft and are therefore transported on dedicated freighters operated either by freight airlines or integrators. In some cases, shippers' requirements will not be met by either bellyhold or dedicated freighter capacity; in such cases, aircraft will need to be specifically chartered to transport goods. Examples of such goods include outsize shipments, goods destined for remote destinations or goods with particular handling requirements – such as live animals.



### Mail

2.15 UK air freight capacity is used for mail by the Royal Mail domestically for its faster delivery options and for most of its international deliveries. Nearly all domestic mail is carried by chartered freighters, whereas European and Intercontinental mail is largely carried in the bellyhold of scheduled passenger flights.

2.16 A small number of freight only airlines operate in the UK in support of the major integrators and the Royal Mail; these operators generally supply both aircraft and crew and effectively lease capacity to the integrators and Royal Mail. In 2017, West Atlantic and Titan Airways accounted for over 90% of the domestic mail carried by air in terms of weight.

## Air freight business models

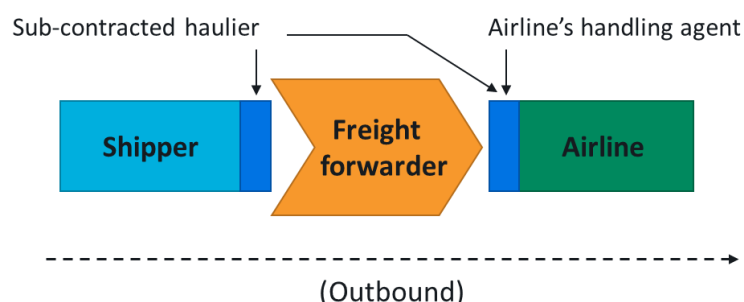
### Forwarder model

2.17 In the forwarder model intermediaries (forwarders) provide the link between those with a requirement for air freight (shippers) and those with the means to provide capacity (airlines), by consolidating consignments from a number of shippers and purchasing capacity from freighter or passenger airlines. This means airlines have little contact with shippers. Many forwarders will ship any type of cargo, but the majority of consignments are general air cargo.

2.18 The forwarder model is illustrated in Figure 2.2. After collecting from the shipper (by subcontracted haulier), the forwarder will often consolidate freight at a regional centre before moving consignments in volume to its warehouses close to an airport, where freight is further consolidated before being sent (by subcontracted haulier) to the airport. At the airport,

consignments may be handed directly to the airline, or – more typically – to the airline’s appointed handling agent.

**Figure 2.2: Typical end to end journey: Freight forwarder**

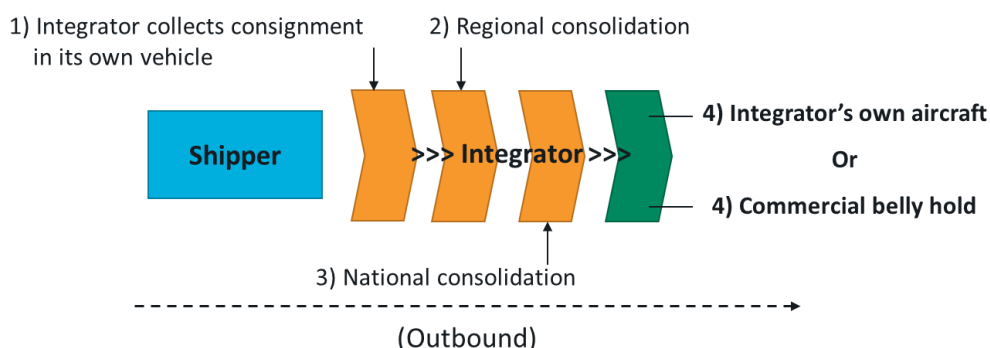


- 2.19 Freight forwarder activity in the UK is concentrated around Heathrow – Heathrow airport Limited (HAL) stated that approximately 450 freight forwarders are located within five miles of the airport. The concentration of forwarder activity around Heathrow also means that cargo leaving from other UK airports (both around London and further afield) is often consolidated around Heathrow before being trucked to the relevant airport, in some cases not actually being flown to or from Heathrow Airport at all.

### Integrator model

- 2.20 In contrast to the forwarder-airline model, the integrator model has sought to offer customers a logistics solution which combines an extensive surface transport collection and delivery network with an in-house fleet of aircraft, thereby offering an “integrated” product, generally controlling the entire logistics chain from pick up to delivery. While the majority of cargo is express-like products, integrators carry all forms of cargo. On short-haul routes, this is predominately with their own aircraft, while on long-haul routes this is often on purchased bellyhold capacity (with the integrator effectively acting as a forwarder in the latter case).
- 2.21 A depiction of the integrator model is shown in Figure 2.3. The integrator will collect the goods and deliver them to the final destination, providing all the links in the transport chain, controlling the choice of mode (where appropriate) and offering a comprehensive information flow along with the physical transport of the goods. This is usually using their own road transport, handling, transit warehousing facilities and (for short haul) aircraft.

**Figure 2.3: Typical end to end journey: Integrator forwarder**



- 2.22 Integrator air freight activity in the UK is dominated by DHL, FedEx, TNT and UPS concentrated at East Midlands (c.50%) and Stansted (c.25%). Only a small number of dedicated cargo freighter flights operate at Heathrow.

## Other models

- 2.23 Although the forwarder and integrator models are the two principal models handling the majority of UK air freight, several other smaller models exist, including:
- Courier and express services, which use either integrators' services or their own small chartered freighters for especially time-sensitive products such as automotive parts or newspapers.
  - Specialist operators, which meet shippers' specific storage or temperature requirements en-route to the airport, in storage before shipping and on board the aircraft for goods such as pharmaceuticals or fresh salmon. Goods may be shipped on specialist freighters or in specialist containers as bellyhold cargo if specified requirements can be met.
  - Air cargo brokers, who do not provide vehicles or warehouse space, but who work with freight forwarders, shippers, logistics providers, governments, and relief organisations to offer chartered freighter aircraft on a onetime or long-term basis.
  - Mail, which is flown domestically on tendered dedicated freighters and internationally using tendered UK and foreign airline bellyhold capacity.

## Trucked freight

- 2.24 Alongside the business models described above, a significant amount of air freight is transported in customs-bonded trucks between the UK and continental Europe and is classified as air freight with an assigned flight number. Freight is often flown to continental Europe, particularly from Asia, as there is often more available air freight capacity than to UK airports, partly due to lack of available slots for freighter aircraft at Heathrow. The freight is trucked as bonded freight to avoid having to undergo local customs procedures so that importers only need to deal with the UK customs authorities rather than investing in systems to deal with multiple customs authorities. This represents an inefficiency from the perspective of the UK economy as whole. See also the Case Study on consumer electronics imports at the end of this chapter.
- 2.25 In contrast to goods from Asia, Heathrow stated that goods destined for North America are also often trucked to the UK, in particular Heathrow, from continental Europe in order to take advantage of cheaper rates from the UK on North American routes. As Heathrow is the primary European hub for North American passenger connections, there is a significant level of bellyhold capacity available, which means air freight rates are cheaper compared to other European airports.

## Structural constraints

### Air freight business models at UK airports

- 2.26 The business models described above dominate the UK's major air freight airports: Heathrow, East Midlands, Stansted and Manchester (see Figure 3.1 below). Heathrow is by far the largest general air freight market using the forwarder business model and the overwhelming majority of cargo is transported in the bellyhold of passenger aircraft, mostly on long-haul routes. East Midlands, by contrast, is dominated by express freight using the integrator business model, with freight carried in freighter aircraft, often overnight on routes to mainland Europe, but also on intercontinental routes. Stansted has a combination of integrators and other freighters, while Manchester is largely bellyhold, although on a much smaller scale than Heathrow.

- 2.27 One notable feature of the UK air freight market is the huge importance of Heathrow and its surrounding freight facilities, with most forwarders having major consolidation centres in the vicinity of the airport, as noted in paragraph 2.19 above. Very significant volumes of air freight are trucked to such facilities near Heathrow, processed and then trucked to another airport, either in the UK or in continental Europe, without ever flying in or out of Heathrow itself.
- 2.28 Another common model is freight arriving from long haul origins (such as China or the US) flown into Heathrow and then being trucked to other airports (e.g. East Midlands) to be flown to continental airports overnight, leading to a symbiotic relationship between the different airports.
- 2.29 Both of these models mean that the resilience of the road network to and from airports is an important factor in reliability of service. To a large extent, they reflect the constraints on the UK air freight industry, discussed further below.

### Operating restrictions

- 2.30 Night operating restrictions, based on movement limit and noise quota systems, are currently in place at Heathrow, Gatwick and Stansted. The current restrictions to October 2022, are summarised for current and future seasons in Table 2.1. The restrictions apply from 11:30pm to 6am, with less stringent restrictions also applying between 11pm and 11:30 pm, and between 6am and 7am.

**Table 2.1: UK airport night-time operating restrictions**

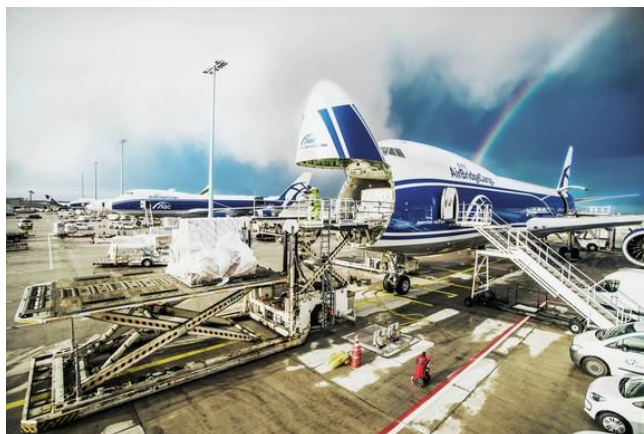
| Airport  | Seasonal Movement Limit   |                    |
|----------|---------------------------|--------------------|
|          | Winter (2018/19 –2021/22) | Summer (2019-2022) |
| Heathrow | 2,550                     | 3,250              |
| Gatwick  | 3,250                     | 11,200             |
| Stansted | 5,600                     | 8,100              |

Source: DfT

- 2.31 There is also an additional noise quota limit incentivising the user of quieter aircraft.
- 2.32 Apart from the restrictions at these three London airports, other airports have to produce noise action plans which may set out operating limits for the night period.
- 2.33 Integrator stakeholders consulted as part of this study stated that the way in which these operating restrictions are applied impacts their ability to operate effectively, as the express business model (described above) is dependent on being able to ship goods during the night to enable maximum productivity for customers who rely on shipments being picked up close to the end of the working day and delivered as early as possible the next.

## Capacity

- 2.34 Several stakeholders have noted that capacity constraints are a significant hinderance to the operation of UK air freight – one stated that it has caused volume growth to fall behind other European countries and another stated it is one of the main reasons why so much freight is flown to mainland Europe and trucked to the UK – in turn causing more road and port congestion.



- 2.35 While many of the UK's airports are not currently particularly congested, the concentration of air freight activity at Heathrow, which is severely slot constrained and which operates at 98% capacity, means that the congestion there has a disproportionate impact on UK air freight. Slot constraints at Heathrow mean that no additional freighter operations are possible, while the larger passenger aircraft such as the A380 actually have lower freight capacity than the aircraft they are replacing, particularly 747s.
- 2.36 Historically, much of the UK air freight activity is concentrated around Heathrow due to its significantly more extensive intercontinental passenger network compared to those of other UK airports. Although this remains the case, new intercontinental passenger connections at regional UK airports have increased possibilities for transporting long-haul freight as bellyhold cargo. As discussed in Chapter 3, some other major UK airports have increased their bellyhold volumes significantly with new connections to Asia – one stakeholder noted that Emirates is the “best in class” at utilising regional capacity.

## Infrastructure

- 2.37 Several stakeholders commented that the quality of the UK's air freight infrastructure is a major issue, with freight facilities at UK airports often being decades old and having suffered from continued under-investment. While other airports are not as slot congested as Heathrow, they now cater to significantly more widebody freight capacity than the facilities were originally designed for.
- 2.38 At Heathrow, the infrastructure has led to severe levels of road congestion, with trucks often queueing for hours at the Cargo Horseshoe (Heathrow's main freight facility), with some operators investing in off-site facilities to mitigate these problems<sup>1</sup>. However, restrictions imposed by the Border Force currently prevents any new such remote-site facilities being developed.
- 2.39 The Heathrow Cargo Working Group has proposed measures to mitigate these problems, including more flexibility in allowing multiple consignments in bonded truck movements around the airport vicinity.

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<sup>1</sup> In particular, some operators have remote “Internal Temporary Storage Facility” (ITSF-R) with customs bond facilities.

## Potential Brexit impacts

- 2.40 Although the terms of the UK's exit from the EU are still being negotiated, withdrawal from the EU has the potential to affect the UK freight industry through changes to customs arrangements and changes to air services agreements (ASAs). The purpose of this section is not to speculate on the likely outcome of the negotiations but to describe the impact of any possible changes to current arrangements.

### *Customs checks*

- 2.41 Under current arrangements, goods traded between the UK and other EU countries are not required to undergo customs checks at ports or airports. However, depending on the terms of the UK's withdrawal agreement, this may cease to be the case. This would mean, firstly, freight traveling by air between the UK and other EU countries may be required to undergo customs checks at airports and, secondly, that freight being trucked in free circulation between the UK and continental Europe may be required to undergo customs checks at ports.
- 2.42 As has been discussed, much of freight being trucked between the UK and continental Europe travels in customs-bonded trucks and freight traveling on these trucks should not be required to undergo additional customs checks at ports should these be imposed. However, it is likely that trucks carrying bonded freight may still be affected by customs checks at ports, if they were introduced, as additional checks of other trucks are likely to cause delays at ports.

### *Air service agreements*

- 2.43 The UK is currently part of European Common Aviation Area (ECAA), which includes all EU member states and a number of other European countries. The ECAA entitles an airline with an operating licence from any ECAA country to operate flights anywhere within the ECAA. For example, a UK airline can currently operate a domestic flight in Germany or an international flight between Ireland and France.
- 2.44 The EU also has a number of bilateral agreements negotiated on behalf of its members with non-ECAA countries, the most important being the 'open skies' agreement with the USA. These agreements are often more liberal for freight services compared to passenger services; the EU-US deal grants 7<sup>th</sup> freedom rights for cargo services compared to 5<sup>th</sup> freedom rights for passenger services. 7<sup>th</sup> freedom rights allow airlines to fly between two foreign countries (for example, a UK airline flying between the USA and Canada), whereas 5<sup>th</sup> freedom rights only allow airlines to fly between two foreign countries if the journey ends or begins in the airline's own country (for example, a UK airline flying between the UK and Mexico via the USA).
- 2.45 Leaving the ECAA without an agreement in place would mean UK airlines would no longer have the right to fly to and from EU Member States under existing arrangements, or to fly to third countries, such as the US, under the terms of the EU's open skies agreements. This



means the UK would be required to fall back on bilateral agreements with both third countries (such as the USA) and ECAA members.

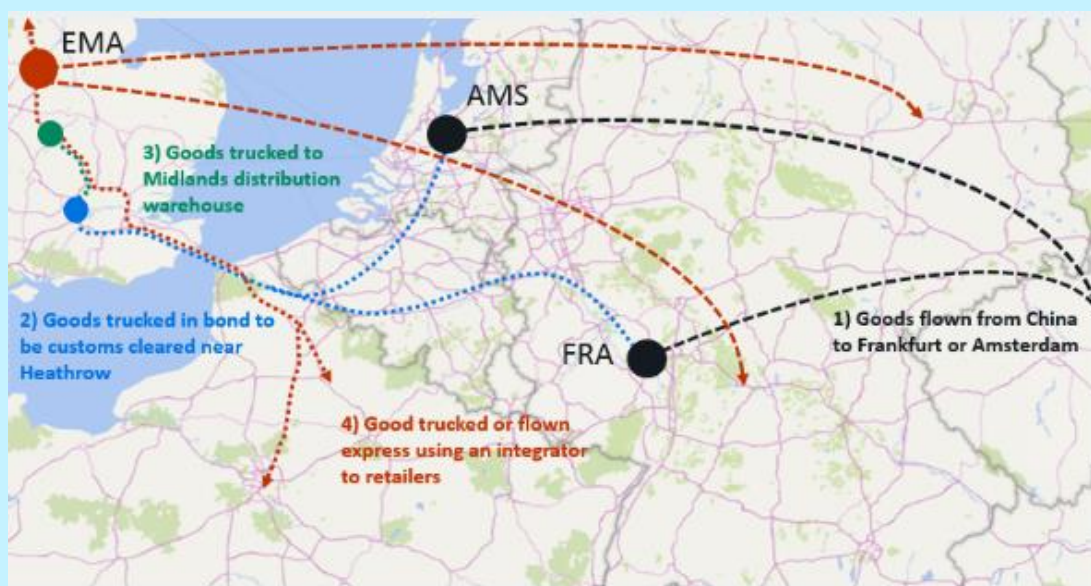
- 2.46 Many bilateral agreements are more restrictive than the ECAA and, for example, the EU-US open skies agreement. This may lead to more restrictions on how freight is flown between different countries, leading to slower transit times and/or higher costs, unless similarly liberal agreements can be negotiated by the UK with the EU and with other key countries such as the US.

### Case Study – Consumer electronics imports

In 2017, the UK imported £10.6 billion's worth of consumer electronics accessories, equivalent to just under 90,000 tonnes of goods. These imports, which are comprised of items such as iPhone cables, car hand-free kits and other similar accessories, are imported primarily from China and other East Asian countries. In 2017, 64% of the total import value was transported by air.

A consumer electronics importer consulted as part of this study, which imports its goods from 20 different locations in China, stated that it imports approximately two thirds of its goods (in value terms) by air, with the remaining third transported by sea. More bulky goods, such as laptop bags and wireless routers tend to be transported by sea, with smaller, lighter items, such as cables, transported by air. Although using air freight is approximately four times more expensive than transporting goods by sea, air freight is often more cost effective as goods can be transported much faster.

Typical journey for imported consumer electronics goods



Since 2008, large retailers selling consumer electronics have been ordering smaller quantities of goods more frequently, which means suppliers need to be able to respond to orders more quickly. As a consequence, volumes shipped by sea have fallen in recent years as, from China to its main distribution warehouse in the Midlands, goods typically take one week by air compared to five to six weeks by sea. This also means warehouse usage has been halved through better management of inventory.

However, despite the need to import goods by air, the importer stated that it only flies around 20% of its total imports directly to the UK, with the remaining 80% being flown to mainland Europe (usually to Frankfurt or Amsterdam) and trucked in bond to the UK via a ferry or the Channel Tunnel. Imports are usually customs cleared at facilities near Heathrow, before being trucked to its Midlands distribution centre.

The importer stated the reason such a high proportion of its goods are flown to the UK via Europe, is because the UK's air freight capacity is not sufficient to service the required import volumes. Goods are trucked as bonded freight to avoid having to undergo Dutch or German customs procedures, as the importer incurs fewer administration costs as it is only required to deal with UK customs.

The importer stated that, as most of its imports are flown in freighter aircraft, one of the reasons why it often cannot fly its goods into the UK, is because not enough UK airlines operate these types of aircraft. Many airlines that in the past operated long-haul freighter services, for example IAG Cargo at Stansted, no longer do; therefore, there are fewer long-haul freighter options available. However, the main problem the importer cited with UK air freight capacity was the quality of the infrastructure.

The importer stated that it avoids using UK airports because they are too congested and therefore not efficient; air freight infrastructure has not been upgraded in line with increased traffic, which causes delays that can be avoided at continental European airports. The importer stated that there should be better utilisation of regional airport capacity at, for example, Manchester, which was cited as a relatively good operation with not enough freight capacity.

## Policy considerations

- 2.48 The analysis in this chapter raises a number of issues relevant to the formulation of national aviation policy. These include:
- the positive and negative aspects of the concentration of the air freight industry at and around Heathrow;
  - the quality of infrastructure supporting air freight services;
  - the balance of the impacts of night and noise restrictions on local residents and air freight services;
  - the potential for growth of air freight services at airports outside the South East of England; and
  - the management of the potential impacts of Brexit.

## 3 Market Analysis

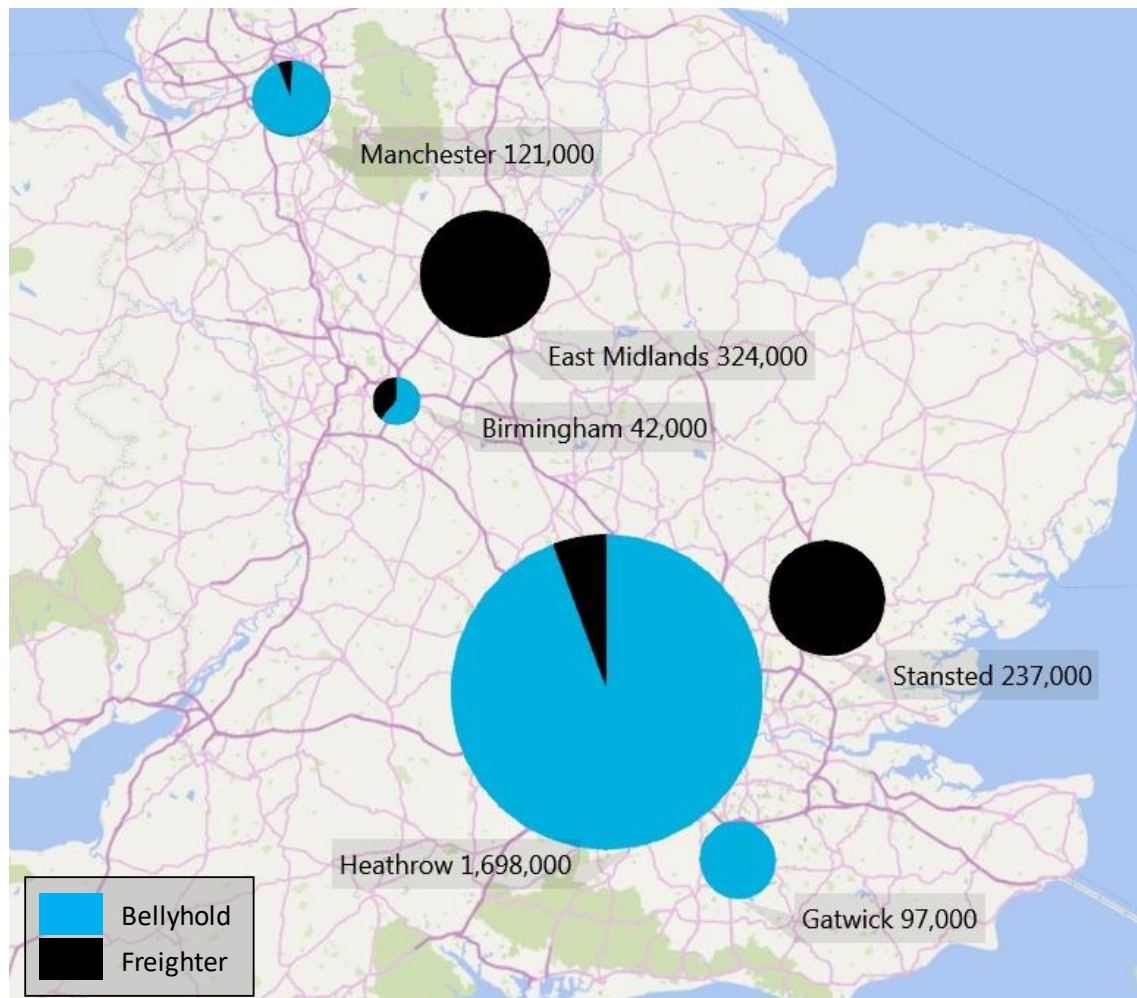
- 3.1 This chapter describes UK air freight volumes flown from key airports as well as recent growth trends, freight destinations, freight activity at other major UK airports and international comparisons. The analysis of UK freight volumes is based on data provided by the CAA and international comparisons based on Eurostat data.

### Overview of air freight volumes

#### Key airports

- 3.2 Figure 3.1 shows the volume (tonnage) and type of freight handled at the six largest UK freight airports – the remaining airports not shown each represent less than 1% of the market in terms of volume.

Figure 3.1: Freight volumes at six largest UK airports, tonnes (2017)



Source: CAA

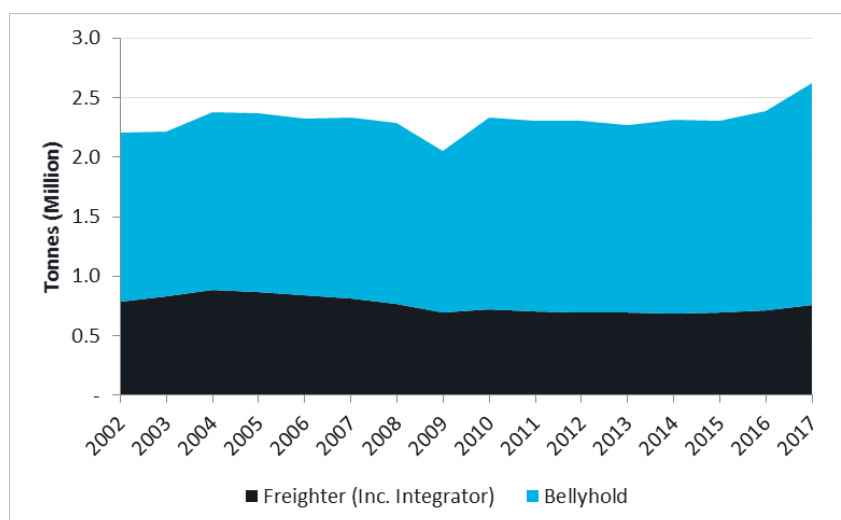
- 3.3 Bellyhold cargo at Heathrow accounted for over 60% of total UK air freight volume in 2017, with forwarders and shippers utilising its extensive intercontinental passenger network. Over 30% of total air freight was shipped on US routes and most of the remainder on Asian routes. The number of freighters at Heathrow are flown by a mixture of cargo-only airlines and passenger airliners with some freighter aircraft.
- 3.4 Freighter and integrator cargo is concentrated at East Midlands and Stansted, which, in 2017, together accounted for over 20% of all UK freight and the majority of freighter (60%) and integrator (79%) activity. Integrators accounted for over 90% of freight at East Midlands, with much of freight being shipped to Europe, particularly Germany, where DHL and UPS both have major hubs, as well as on intercontinental routes. At Stansted, integrators FedEx and UPS were the largest airlines, although intercontinental freighters such as Qatar Airways, Cargolux and China Southern also accounted for a large share of volume.
- 3.5 Almost all freight at Gatwick and Manchester was carried as bellyhold cargo in 2017, predominately to the UAE and the USA. Although both airports had relatively large freighter operations prior to the financial crisis, these operations have ceased completely at Gatwick and almost completely ceased at Manchester. Prior to 2016, freight handled at Birmingham was almost all bellyhold, and although most of Birmingham's freight volume was carried as bellyhold cargo to Asia in 2017, about a third of its volume was freighter and integrator cargo.



### Volume growth

- 3.6 Figure 3.2 shows the development of total UK freight volumes in the last 15 years. Aside from the decline in 2009 due to the fallout from the financial crisis, total volumes have remained relatively flat, growing with a compound average growth rate (CAGR) of +1.2% over the 15-year period with volumes only surpassing the pre-crisis peak in 2016.

Figure 3.2: UK freight volumes, Million Tonnes (2002-2017)



Source: CAA

- 3.7 The relatively modest CAGR of +1.2% for total volumes is due to a combination of growing bellyhold volumes, which over the 15-year period grew with a CAGR of +1.8%, and stagnating freighter volumes, which declined with a CAGR of -0.2%.
- 3.8 The share of total volumes carried by freighter aircraft has fallen from over 35% in 2002 to under 30% in 2017 and has fallen away significantly at some airports. The market for dedicated freighter services has struggled globally since the financial crisis due to falling sea-freight rates and the continued rise of air passenger demand (and associated bellyhold capacity), which have driven down freighter yields. Although some UK airports have retained important integrator, and to lesser extent, freight operations, freighter activity has remained relatively flat in recent years and is currently lower than pre-crisis levels.
- 3.9 Although bellyhold cargo volumes have grown more strongly and are now above pre-crisis levels, their growth has been somewhat inhibited by capacity constraints at Heathrow and limited intercontinental networks at many other UK airports. However, combined bellyhold and freighter volumes grew by 10% in 2017, which suggests the slow growth of the previous few years may have ended.
- 3.10 The +1.2% CAGR for total UK volumes to some extent masks the mixed performance of different UK airports. Heathrow, East Midlands and Stansted have grown relatively steadily over the last few years, whereas smaller airports have seen more significant increases or decreases in volumes (discussed further later in this chapter). The net result has been a consolidation of freight operations at the largest airports. Between 2002 and 2017, Heathrow's share of total volumes increased from 56% to 65%, while the combined share of East Midlands, Stansted and Manchester increased from 23% to 26%.

## Destinations

- 3.11 Figure 3.3 shows the origin/destination of freight handled at UK airports in 2017<sup>2</sup>. Across all airports, North America was the largest market (accounting for 32% of volume), followed by Europe (25%, 18% of which was to the EU) and, South and East Asia (19%). Heathrow, and to a lesser extent Gatwick, handled predominately North American and Asian freight, benefitting from extensive passenger networks.
- 3.12 The large European share of volume at East Midlands reflects the airport's role within its integrators' networks, as DHL and UPS have major hubs in Leipzig and Cologne respectively. Similarly, at Stansted, much of the freight volume is on European and North American routes – FedEx has a major hub in Memphis and Stansted is used by FedEx and other

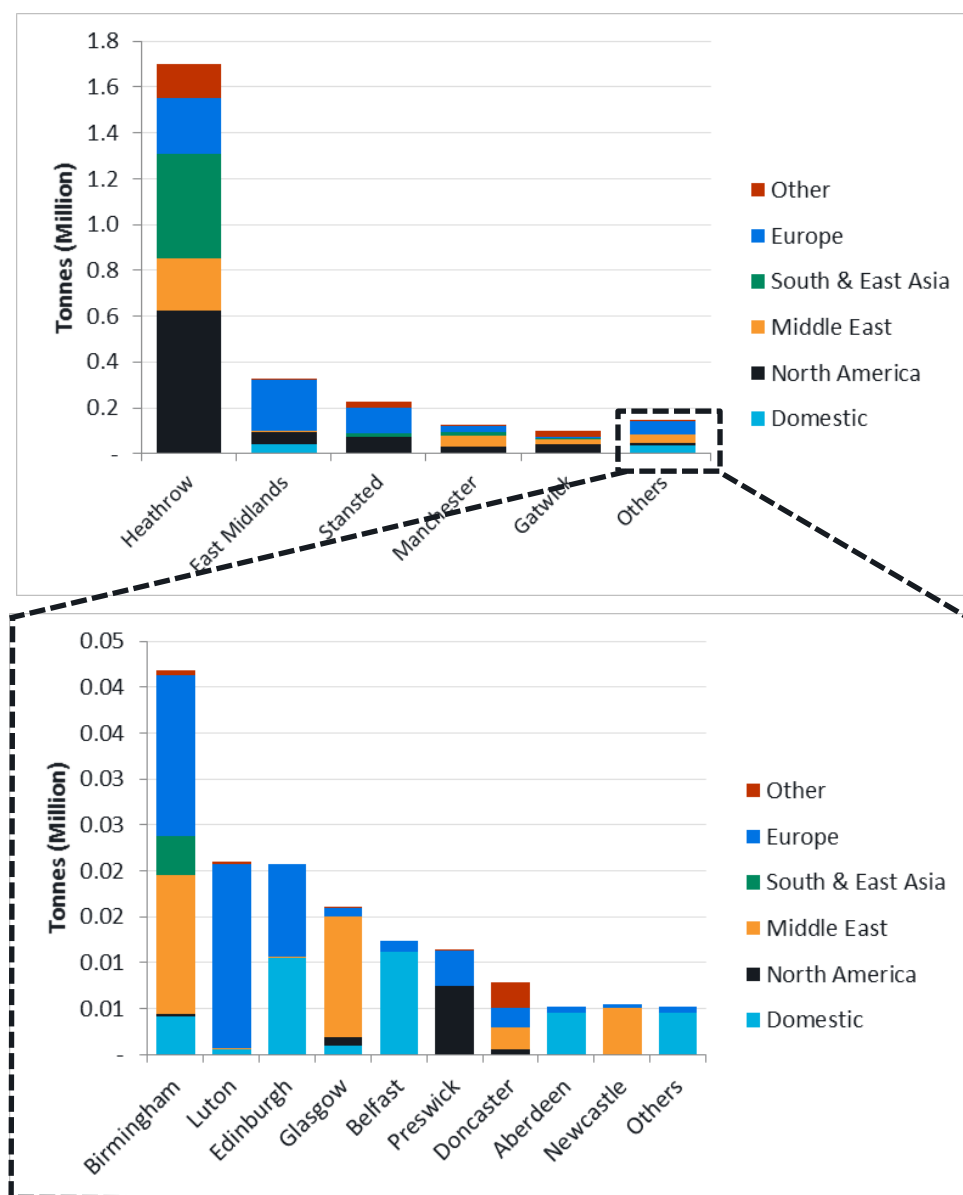


<sup>2</sup> Note that this is based on the origin/destination of the flight to/from the UK, which is not necessarily the same as the true origin or final destination of the cargo itself.

operators for distribution throughout Europe.

- 3.13 A relatively large share of many regional airports' (including Manchester, Birmingham, Glasgow and Newcastle) volume is accounted for by Middle Eastern routes, reflecting the importance of the Gulf carriers' networks to these airports' freight operations. As commented above, stakeholders noted Emirates is one of the best airlines at utilising regional airport capacity.
- 3.14 Airports in Scotland and Northern Ireland, such as Aberdeen, Belfast and Edinburgh, have a relatively large share of domestic volumes, which is likely to be because trucking to other parts of the UK from these locations is less time-effective.

Figure 3.3: Destination<sup>3</sup> of UK freight volumes, Million Tonnes (2017)



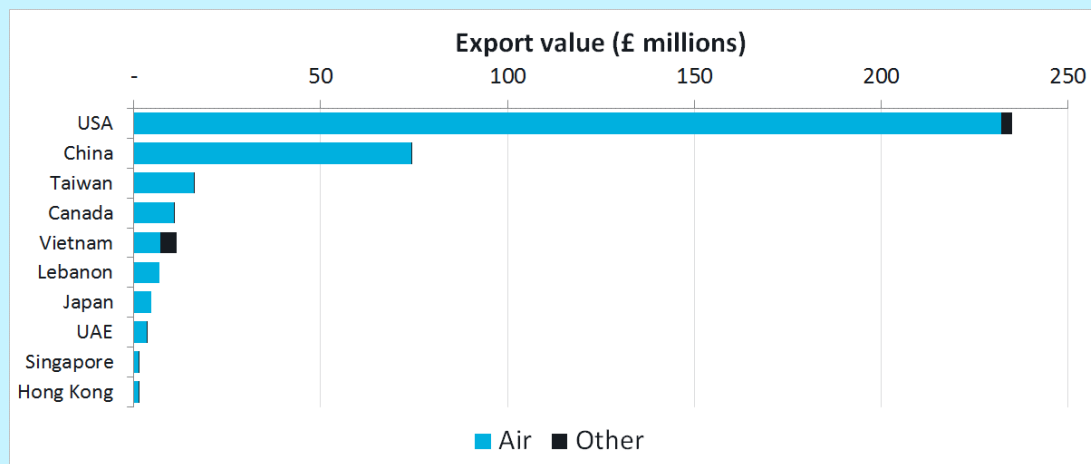
Source: CAA

<sup>3</sup> The "destination" as defined in CAA data is the destination of the flight departing the UK (or origin of arriving flight). It is not necessarily the final destination (true origin) of the freight consignments themselves, as they may be transhipped onto subsequent flights to onward destinations.

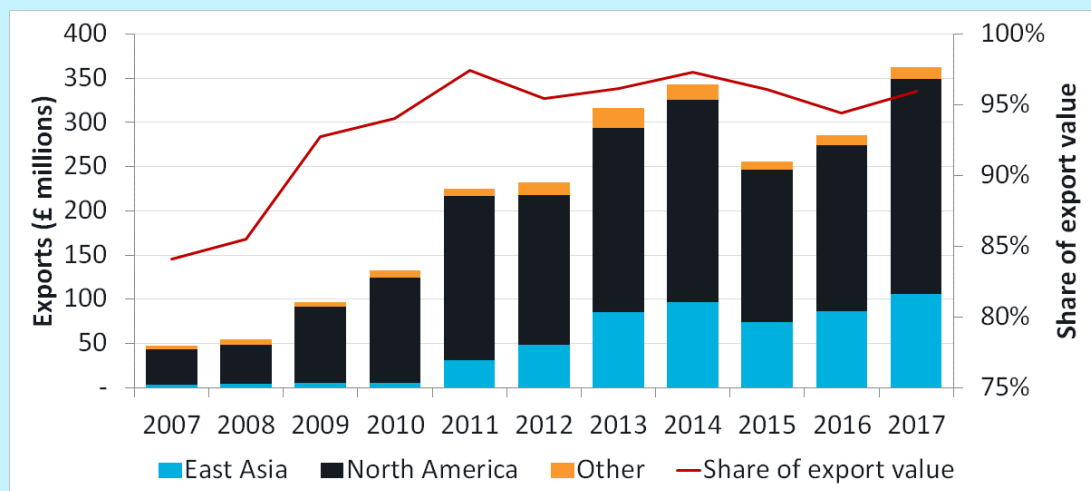
## Case Study – Heathrow and the Scottish salmon industry

Scottish salmon exports were worth £600 million in 2017, up 35% on the previous year. In recent years, salmon has become one of the UK's most valuable food exports. Compared to other salmon sold worldwide, the Scottish industry has positioned itself as providing a higher quality product. Air freight is important for getting produce to market quickly to be sold as fresh as possible. Although the USA and France have remained the two largest markets, demand from East Asia has increased significantly in recent years. The share of salmon carried by air has increased with growing intercontinental demand.

2017 10 largest non-EU markets for salmon exports



2007-2017 value of salmon exports to non-EU countries

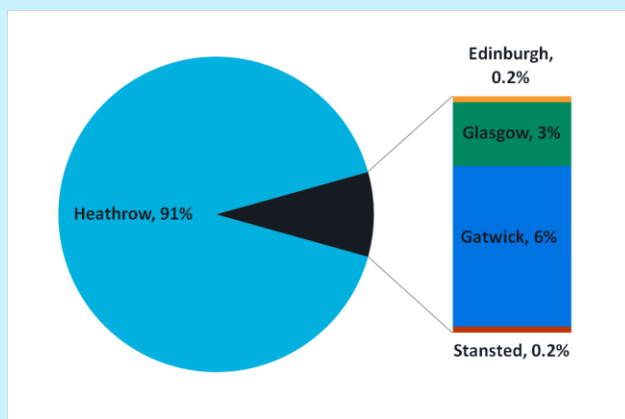


Source: HMRC

The vast majority (91%) of UK salmon is shipped internationally from Heathrow – produce is transported within the UK either by road or by air. While in transit, salmon is stored in temperature-controlled containers and may be stored at specifically designed facilities at Heathrow before being shipped. Outbound capacity must be pre-booked in advance and packing typically takes place 2-3 days before shipping.

While Heathrow is still by far the largest airport supporting the industry (see chart below), increased international connectivity at Scottish airports has given exporters other options – this year salmon was exported on the first direct flight between Scotland and China (from Edinburgh to Beijing).

#### 2017 share of UK salmon exports by airport

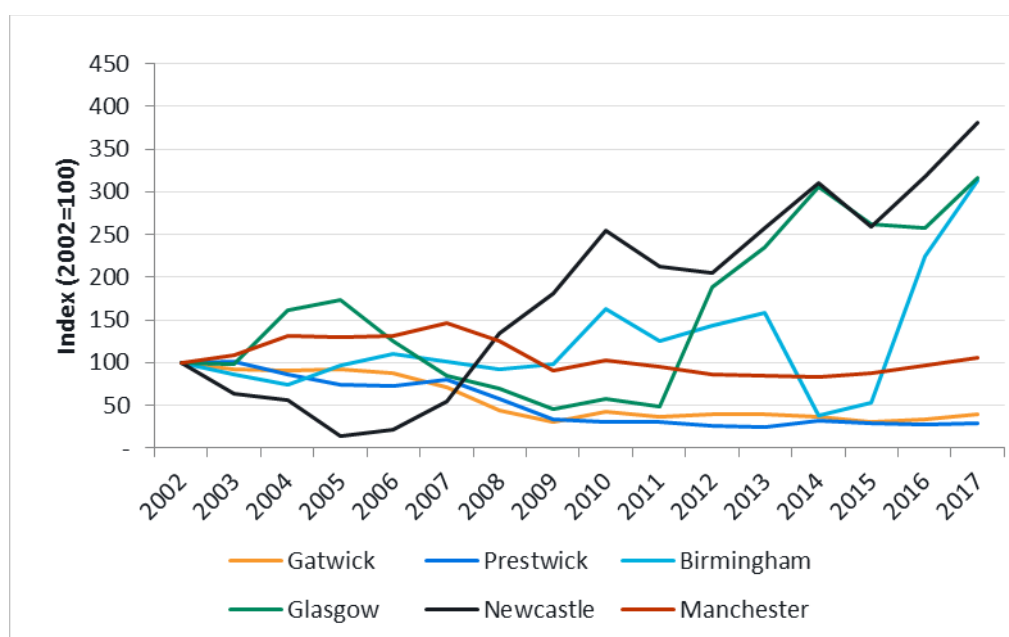


Source: HMRC

### Volumes at regional airports

- 3.15 As discussed above, the +1.2% CAGR for total UK volumes between 2002 and 2017, shown in Figure 3.2, to some extent reflects the mixed performance of different UK airports. Figure 3.4 shows the development of total freight volumes at selected UK airports (not including the largest three freight airports: Heathrow, East Midlands and Stansted).

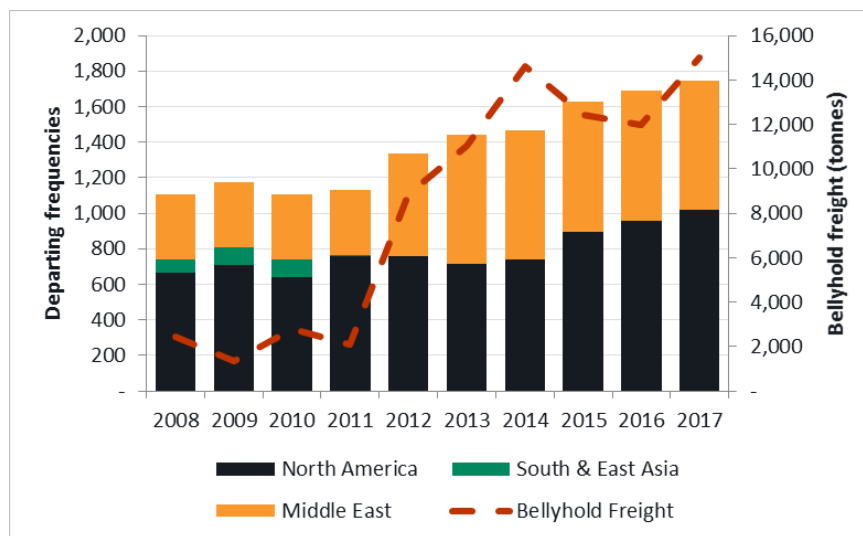
Figure 3.4: Indexed growth of freight volumes at selected UK airports, 2002=100 (2002-2017)



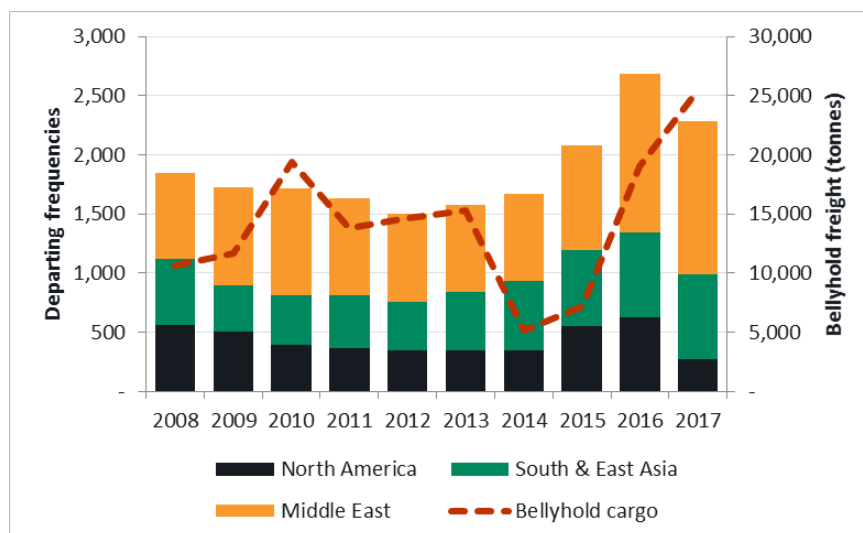
Source: CAA

- 3.16 Relatively significant freight operations at Gatwick and Prestwick (which in 2002 were respectively the second and sixth largest UK freight airports) have fallen to less than half of their pre-crisis levels. On the other hand, smaller operations at regional airports, such as Birmingham, Glasgow and Newcastle have increased significantly in recent years, as a result of new or increased frequencies on intercontinental passenger routes. Manchester has experienced a mix of these effects; driven by a reduction of freighter activity, total volumes decreased significantly since the financial crisis, but have grown in recent years as a result of new passenger bellyhold connections.
- 3.17 The figures below show, for selected regional airports, the number of departing frequencies to intercontinental destinations (represented by the stacked bars) and the total bellyhold freight volumes (represented by the red line). Charter and low-cost carrier frequencies have been excluded as these do not contribute materially to total freight volumes.

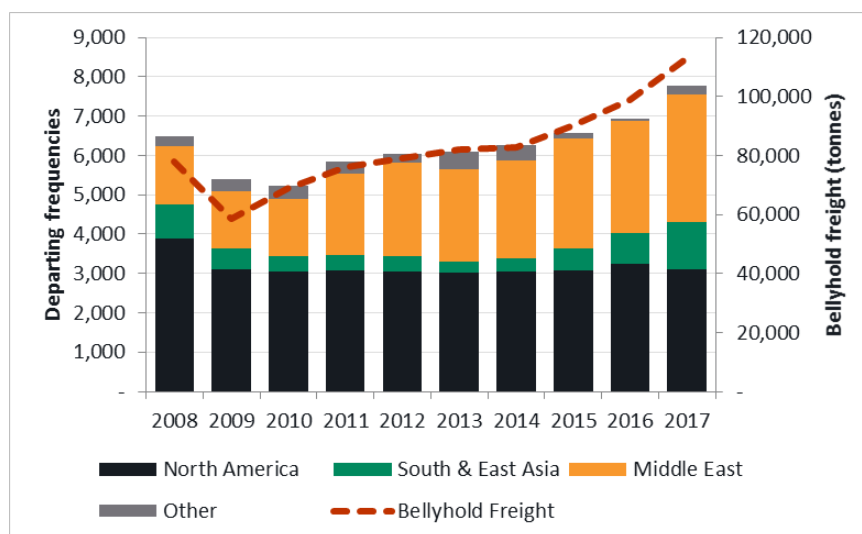
**Figure 3.5: Glasgow: Departing frequencies and bellyhold freight volumes (2002-2017)**



**Figure 3.6: Birmingham: Departing frequencies and bellyhold freight volumes (2002-2017)**



**Figure 3.7: Manchester: Departing frequencies and bellyhold freight volumes (2002-2017)**



Source: OAG, CAA

3.18 At the three airports shown in the figures above, increasing frequencies to the Middle East and Asia have significantly increased total bellyhold freight volumes. Although all three airports have had a sustained level of passenger connections to North America, as Figure 3.3 demonstrates, North America does not account for material amount of freight volumes at these airports. This is likely to be because of the large amount of North American bellyhold capacity available at Heathrow, which means shippers and forwarders have little incentive to utilise regional capacity on North American routes.

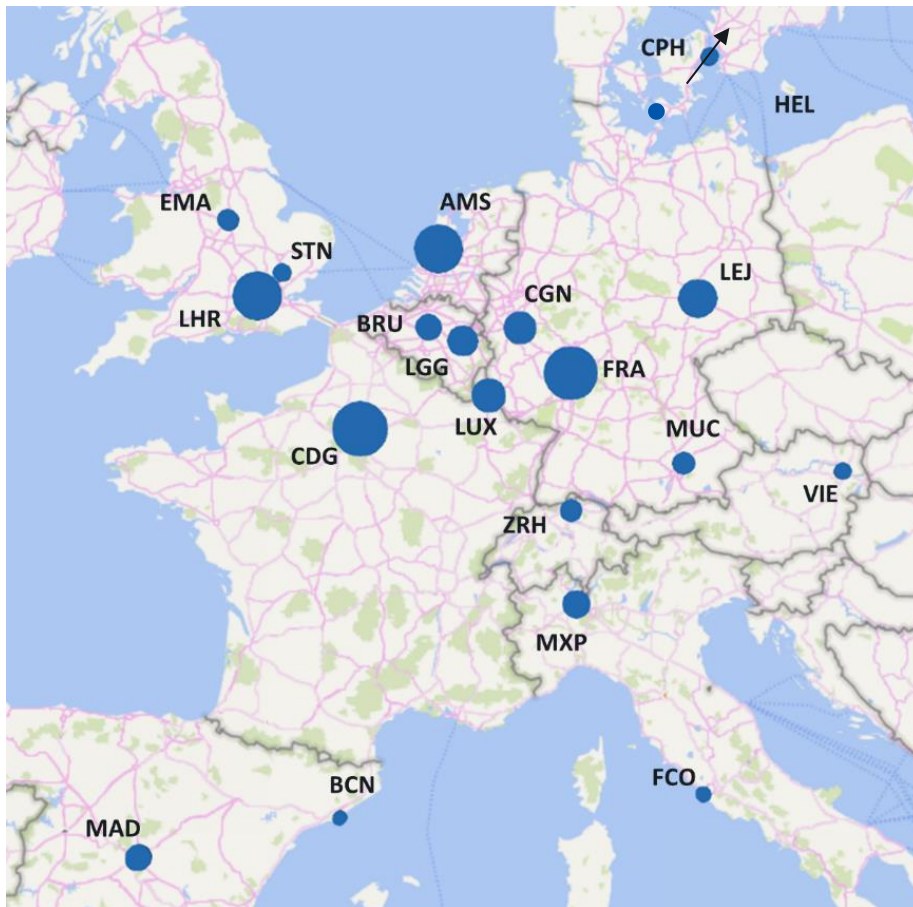
3.19 On the other hand, Heathrow has relatively less bellyhold capacity available on Asian and Middle Eastern routes, which means airlines have a greater incentive to utilise regional airports on these routes (although five new Chinese routes have started operations from Heathrow in 2018). Other airports' freight volumes have also benefited from their own new connections to East Asia. Direct passenger connections have recently started at Manchester (2016) and Edinburgh (2018) and, given the capacity constraints at Heathrow, it is likely that other airports' freight volumes will continue to benefit from the rapidly growing Asian economies.



## International comparisons

3.20 Figure 3.8 shows 20 largest EU airports in 2017 based on total freight volumes.

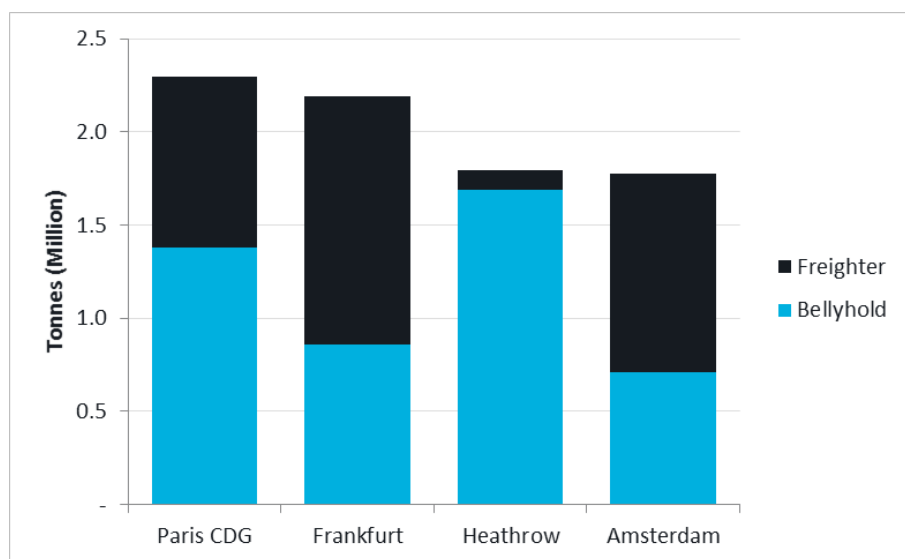
**Figure 3.8: Relative freight volumes at 20 largest EU airports (2017)**



Source: Eurostat

- 3.21 Many of the largest freight airports in the EU are concentrated in North-West Europe, which is relatively well off and densely populated (therefore generates demand for imports), and is the home of a lot of European industry (therefore produces a large amount of goods for export). The close proximity of many large freight airports to the UK may also to some extent explain why so much air freight is flown to continental Europe and trucked to the UK, as there is much greater capacity available to continental North-West Europe than to the UK.
- 3.22 In terms of total freight volumes, Heathrow is the third largest airport in the EU (based on Eurostat data) and handles a similar magnitude of freight to that handled by Europe's other three major hub airports (Amsterdam, Frankfurt, Paris). Although East Midlands and Stansted are two of the twenty largest freight airports in the EU, they are significantly smaller than many of the freighter-orientated airports in Europe (including Cologne, Luxembourg, Liège and Leipzig).
- 3.23 Although Heathrow is one the largest airports in the EU in terms of freight volumes, due to its slot and operating constraints described above, it has a significantly lower amount of freighter activity compared to many major European airports. Figure 3.9 shows the share of total freight volumes carried by freighter and bellyhold capacity at the four major European hub airports.

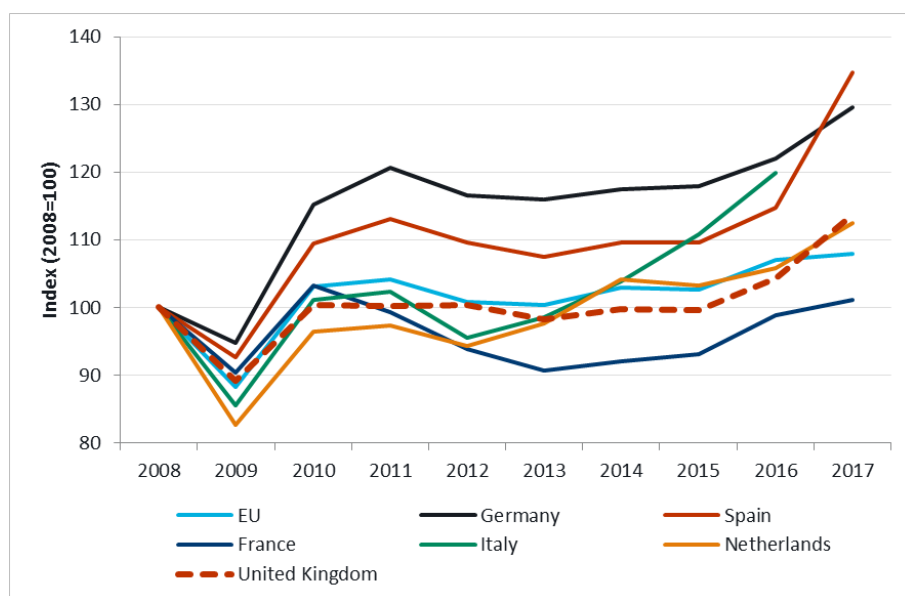
**Figure 3.9: Freighter and bellyhold volumes at four largest European airports, Million Tonnes (2017)**



Source: Eurostat, CAA, individual airport traffic statistics (Paris CDG shares based on 2016/17)

- 3.24 At Heathrow in 2017, 6% of total freight volumes were carried by freighter aircraft compared to between 40% and 60% at Amsterdam, Frankfurt and Paris. Although Heathrow and Amsterdam carried very similar levels of freight in 2017, there were around 3,000<sup>4</sup> freighter air traffic movements at Heathrow compared to just under 17,800 at Amsterdam.
- 3.25 Figure 3.10 shows the indexed growth of total air freight volumes in the UK against comparable EU countries, as well as the EU as a whole, from 2008 to 2017 (and 2016 for Italy).

**Figure 3.10: Indexed growth of selected EU countries freight volumes, 2008=100 (2008-2017)**



Source: Eurostat. Note: France's growth prior to 2014 has been adjusted with ADP statistics to account for a change in measurement at CDG

<sup>4</sup> 2,971 non-passenger movements (source: CAA)

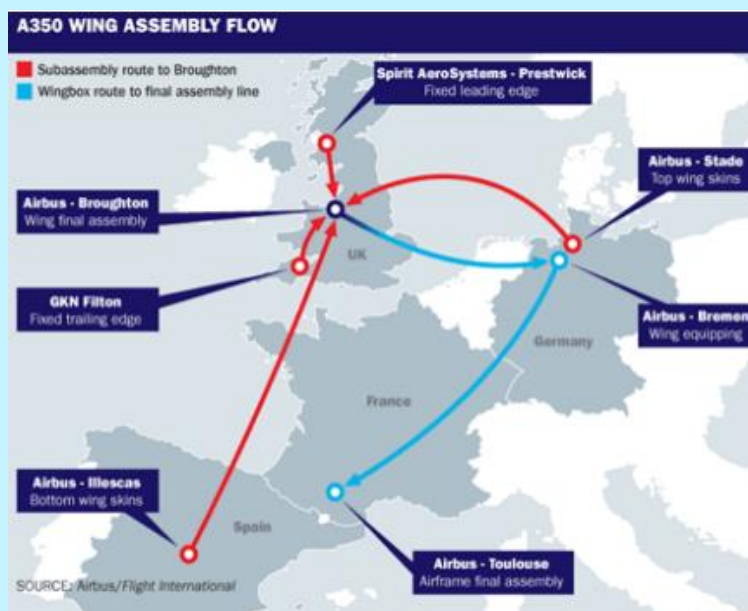
- 3.26 Although, like many of the countries shown, the level of growth in the UK appears to have picked up in the last couple of years, over the period shown, growth in the UK air freight volumes appears to have been lower than the growth in many other major European economies (with the exception of France).

### Case study - Aerospace

The UK aerospace sector is one of the largest in the world which, according to ADS (a UK Aerospace trade organisation), had a total turnover of £45 billion in 2017 and supported 123,000 direct jobs. ADS also states that nearly 90% of final demand for UK aerospace products comes from exports. However, a large volume of goods are also imported, as aerospace supply chains are often located in several different countries, and as much of the UK's aerospace industry focuses on manufacturing aircraft parts, large quantities of components need to be regularly transported in and out of the UK.

In 2017, non-EU trade in aircraft and associated equipment<sup>5</sup> was worth £17.2 billion, equivalent to a little over 48,000 tonnes of equipment. In addition, trade in engines<sup>6</sup> (a large proportion of which are aircraft engines) was worth £28.4 billion, equivalent to a little over 32,000 tonnes of equipment. Air transport accounted for 76% of trade value in aircraft and associated equipment and 89% of trade value in engines. For both these product types, the value of imported and exported goods flown by air was very similar, reflecting the international nature of the production process and the flow of goods between countries. Some of the world's most important aerospace firms are UK-based (BAE, Rolls Royce) and many of the world's largest aerospace manufacturing firms (Airbus, Boeing, Bombardier) have significant operations in the UK. For example, UK manufacturing sites are an integral part of the production process for the wings of Airbus aircraft (see map below).

#### Airbus wing assembly production flow



Source: HM Treasury (via Airbus/Flight International)

<sup>5</sup> SITC code 792

<sup>6</sup> SITC code 714

Airbus's assembly line for its A350 wings demonstrates air freight's role in these international production processes. Composite front spars are produced in the USA by Spirit and flown to its facility in Prestwick for assembly; these are then trucked to Airbus's facility in Broughton and are combined with other parts trucked from Filton (UK), flown from Stade (Germany) and from form Illescas (Spain). Completed wings are then flown to Bremen (Germany) for equipping, before being flown to Toulouse for final assembly.

As well as aircraft manufacturing, air freight is also important for facilitating aircraft maintenance and repair operations (MRO).

The figure below shows, on a £/kg basis, the top five UK airports with the most valuable cargo. With the exception of London City (which handles large amount of jewellery and diamonds), all are airports used as a base for aircraft manufacturing plants (Bombardier at Belfast City and BAE at Warton) or MRO (IAG at Cardiff and Marshall at Cambridge). Compared to other imports and exports, this demonstrates the high value of goods and components transported by air within the aerospace sector.

**Value of airport cargo - £/kg basis (2017)**



## Policy considerations

3.27 The analysis in this chapter shows that air freight has started to grow again after several years of stagnation. The increasing volumes and longhaul connections at major airports outside the South East of England as well as the prospect of the third runway bringing additional capacity at Heathrow, give rise to a number of policy issues for consideration, including:

- how to make best use of existing infrastructure and unlock more capacity through investment in air freight facilities at UK airports;
- how to manage the air freight implications of the third runway at Heathrow; and
- how to support the air freight sector to grow sustainably.

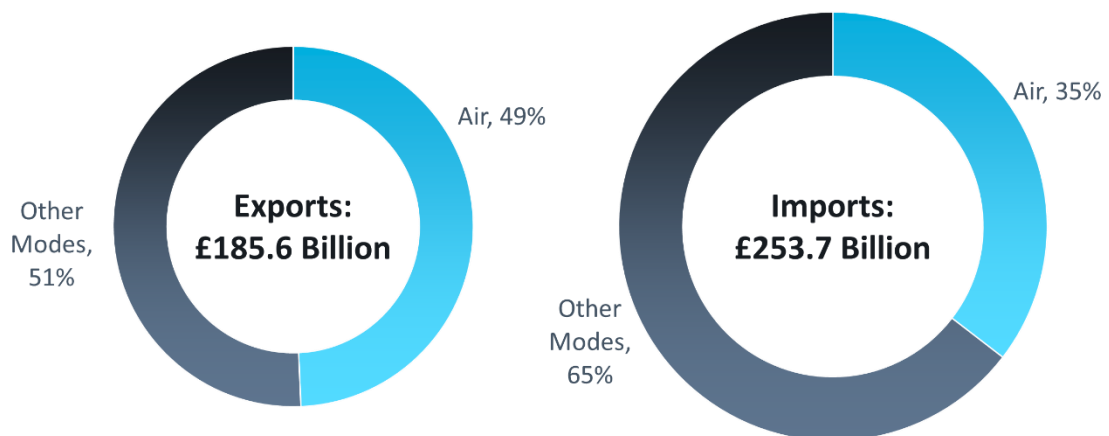
## 4 International Trade

- 4.1 This chapter examines the breakdown of air freight flows in terms of the commodities flown and their value. We firstly compare the value of imports and exports by air in comparison with the total by all modes, then go on to examine the key product and geographic markets. We also provide a comparison of UK trade with that of other major European markets.
- 4.2 The analysis of UK trade presented in this section is based on import and export data within HMRC's data downloads, and therefore relates only to trade with non-EU countries. Although HMRC does provide estimates of arrivals and dispatches to and from EU countries, the level of detail provided is insufficient to undertake the analysis presented in this section for non-EU trade.

### Role of air freight in UK trade

- 4.3 In 2017, non-EU trade classified as being transported by air accounted for over 40% in terms of value but under 1% of total trade in volume terms (with sea accounting for over 98%). Air as a proportion of total exports and imports in 2017, in value terms, is shown in Figure 4.1.

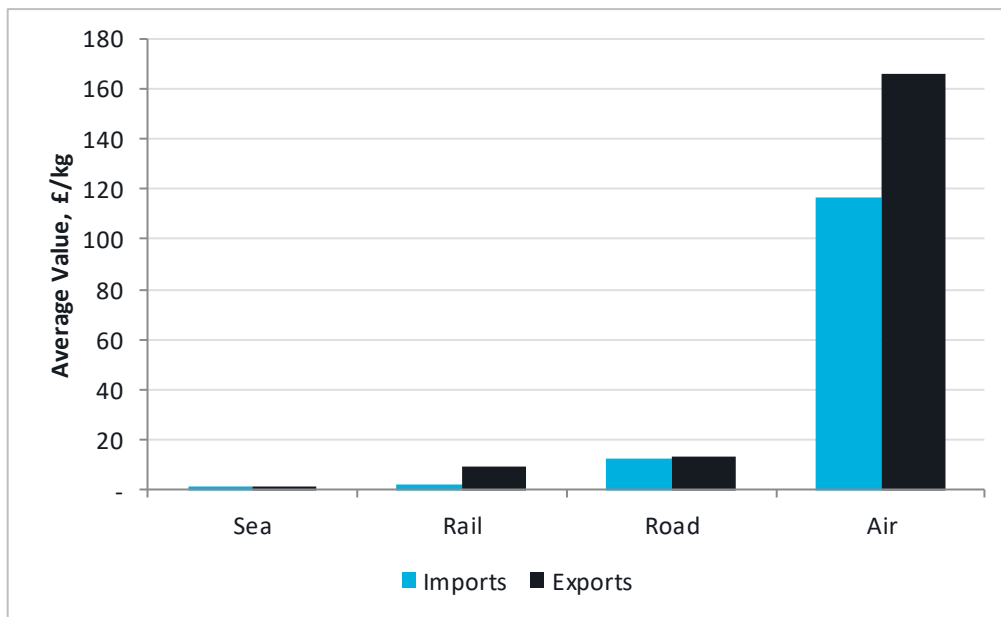
**Figure 4.1: Air transport's share of total export and import value, £ Billion (2017)**



Source: HMRC

- 4.4 Figure 4.2 shows the average value per kilogram, of exports and imports, for goods transported by sea, rail, road and air. Goods transported by air, on average, are significantly more valuable than those transported by other modes.

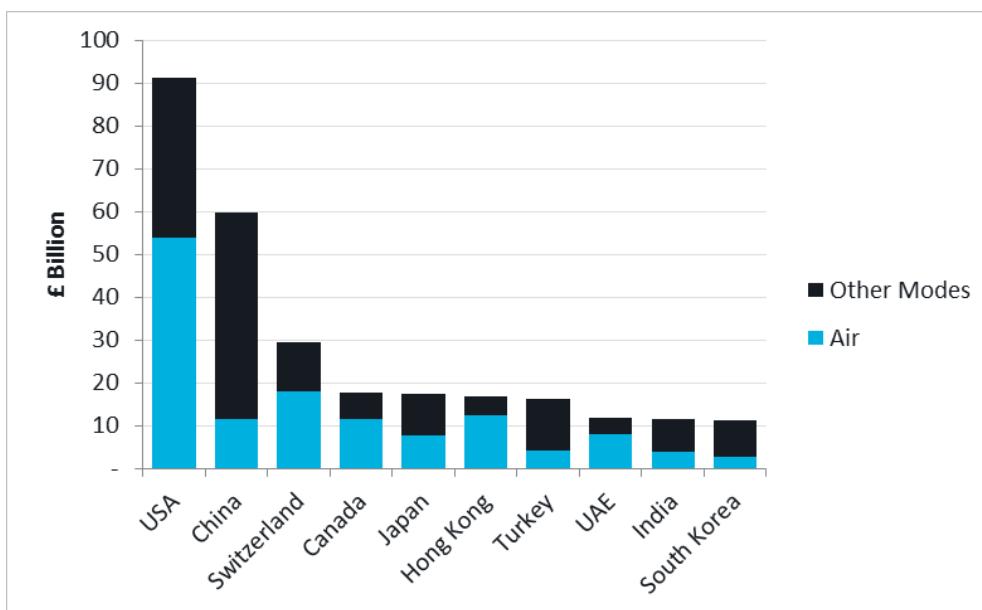
**Figure 4.2: Average value of goods transported by each mode, £/kg (2017)**



Source: HMRC

- 4.5 Similarly, for the UK's top ten non-EU trading partners, in volume terms, air accounted for under 1% of trade in most cases (but 1.3% with the US and 1.5% with India). Only with the USA (1.3%) and India (1.5%) did air account for over 1% of trade in volume terms. However, air accounted for a much higher proportion of trade with the UK's top ten trading partners in value terms.
- 4.6 Figure 4.3 shows the proportion of trade by value transported by air with the UK's top ten non-EU trading partners. Air generally accounts for a higher proportion of trade value with other service and high-end manufacturing-orientated economies (such as the USA and Switzerland), and has lower share with Asian mass manufacturing-based economies (such as China and India).

**Figure 4.3: Air transport's share of trade value with largest non-EU trading partners, £ Billion (2017)**



## Geographical markets

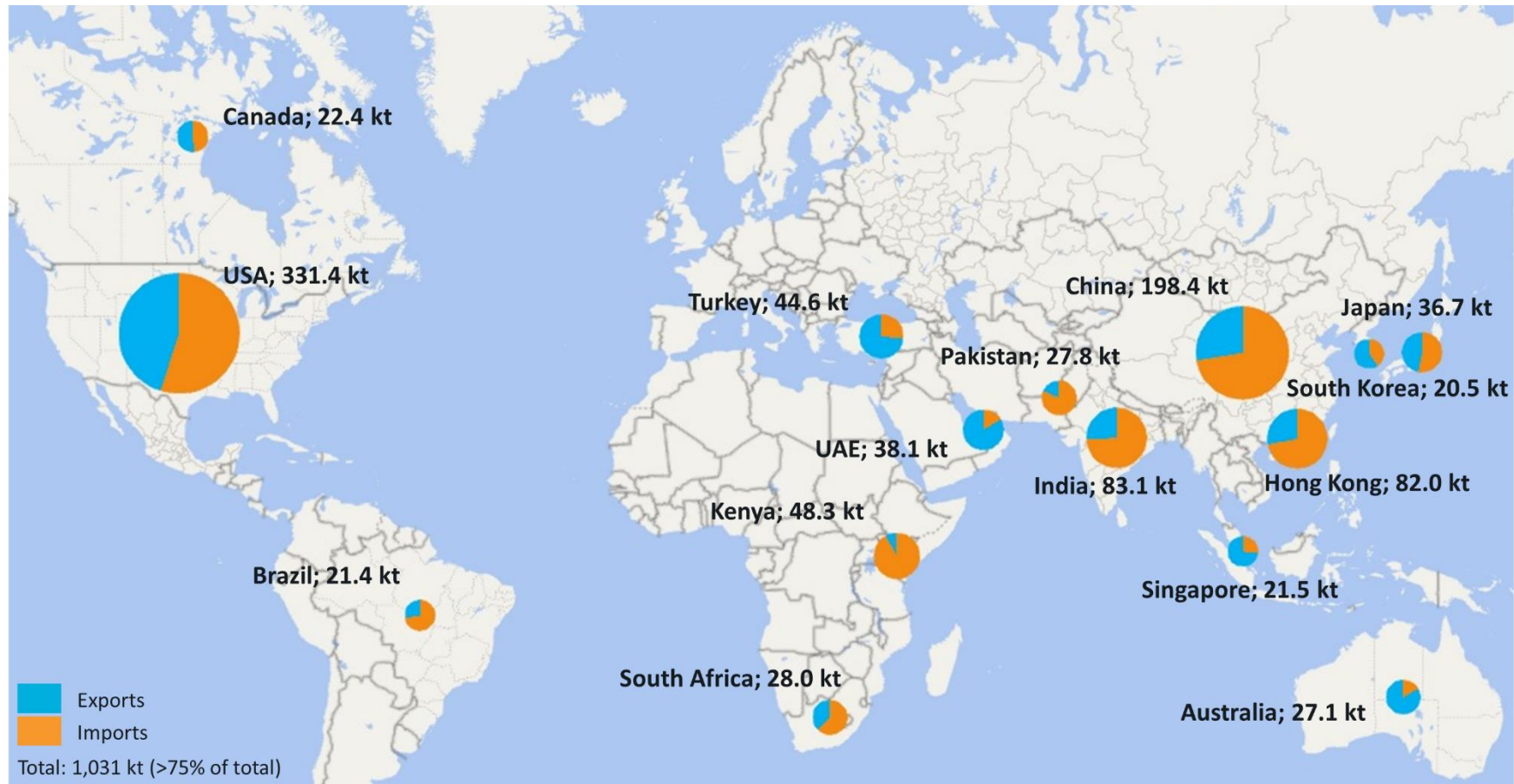
4.7 The size of the import and export markets with the UK's top 15 non-EU trading partners, separately in volume and value terms are shown in Figure 4.4 and Figure 4.5, respectively. Note that although many countries feature within the UK's top 15 non-EU trading partners, in both volume and value terms, the two figures do not show the same 15 countries.

4.8 With its major trading partners, in volume terms, the UK's imports are characterised by a mixture of mass manufactured goods (such as clothing) from Asian countries including China, India and Pakistan, and more high-value manufactured products (such as electronics and machinery) from countries including Japan and South Korea. The UK also imports a significant amount of food and raw materials from countries including Brazil, Kenya and South Africa. On the export side, UK volumes are characterised by high-end manufactured goods (such as transport or scientific equipment) and food, in particular salmon, to higher income countries.



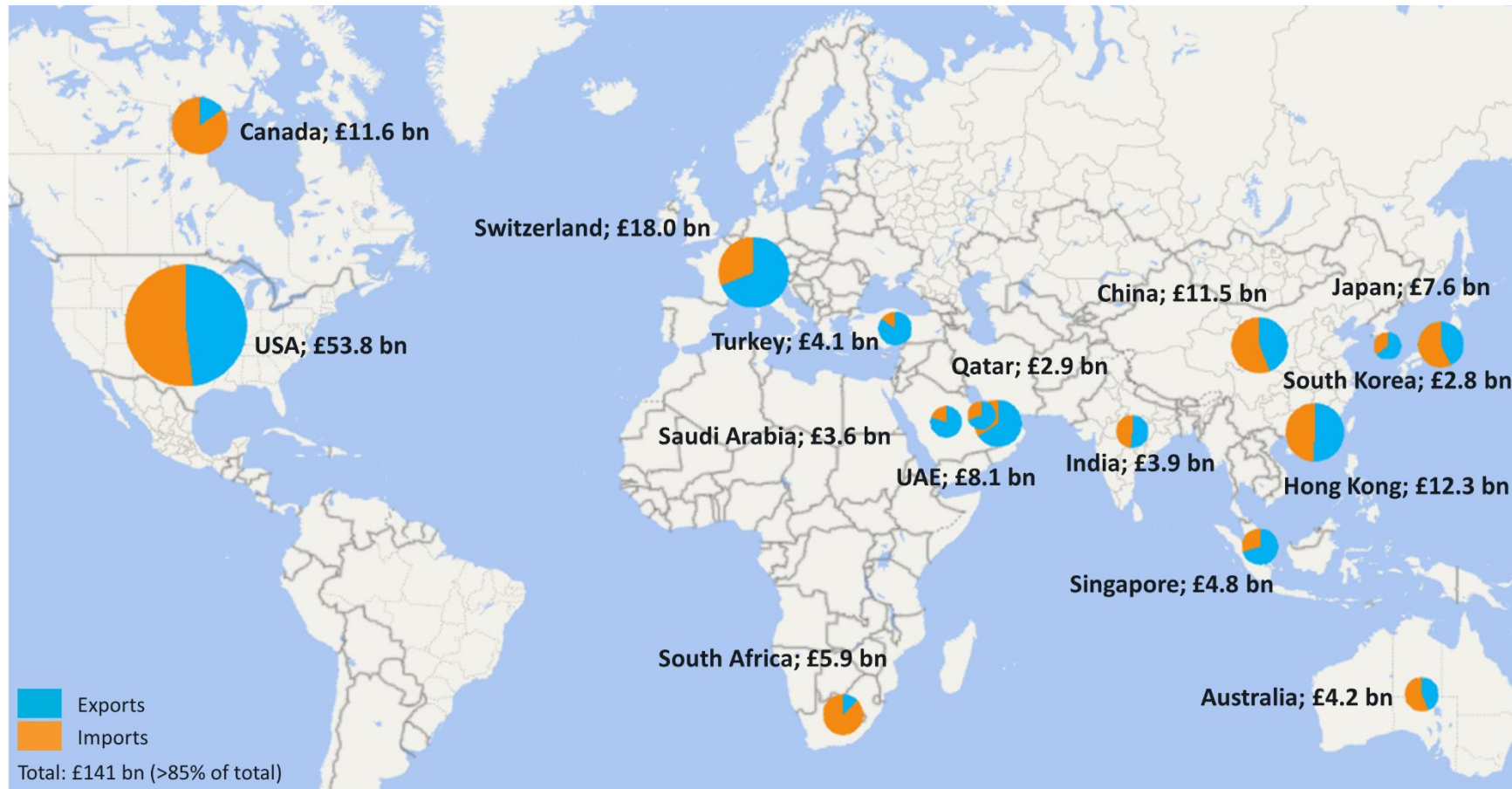
4.9 In terms of value, many of the UK's major trading partners in Asia and North America are also major trading partners in volume terms; however, in value terms UK exports account for a higher share of trade. As with volumes, much of the import and export value is accounted for by high-end manufactured goods (such as industrial machinery) as these goods are high value as well as high volume. Much of the trade with the UK's major partners, in value terms, is accounted for by precious metals and minerals (such as gold), which is high-value but low-volume. This includes imports from countries where these materials are mined, including South Africa, Australia and Canada, as well as Switzerland, which has a large gold refining industry.

Figure 4.4: Volume of air exports and imports with top 15 non-EU trading partners, 1,000 tonnes (kt) 2017)



Source: HMRC

Figure 4.5: Value of air exports and imports with top 15 non-EU trading partners, £ Billion (2017)



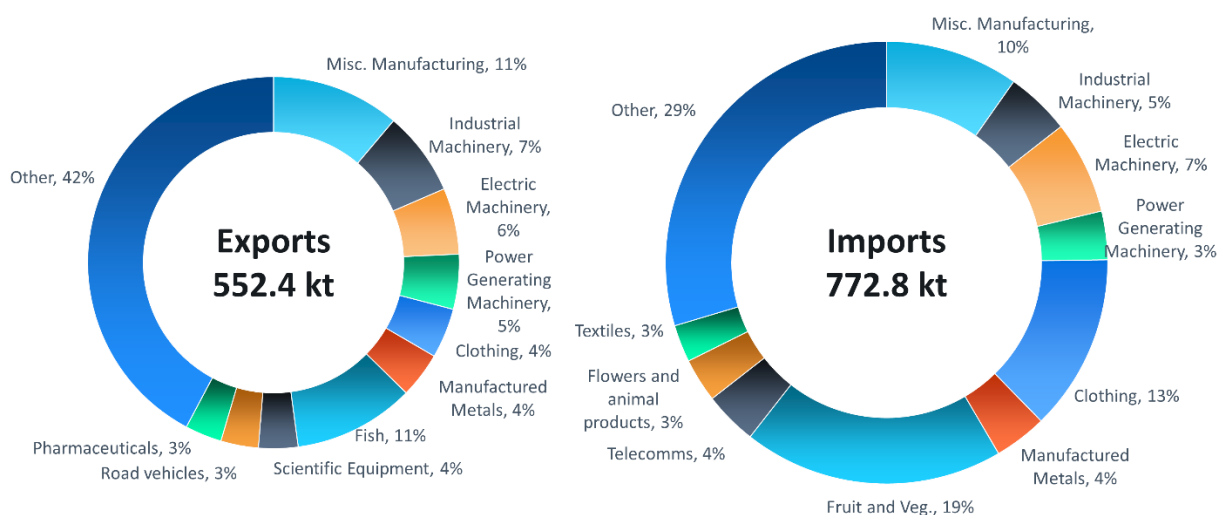
Source: HMRC

## Product markets

### Products shipped by air

- 4.10 The UK's exports and imports to all non-EU countries at a 2-digit Standard International Trade Classification (SITC) code level, in volume terms, are shown in Figure 4.6.

**Figure 4.6: UK non-EU exports and imports at a 2-digit SITC code level, 1,000 tonnes (kt) (2017)**



Source: HMRC

- 4.11 Clothing and fruit / vegetables are the two largest 2-digit SITC product groups imported by air. Fruit and vegetables are perishable and therefore need to be delivered quickly, while clothing is often shipped by air to enable retailers (particularly online retailers) to meet shifting demand of the latest fashion trends.

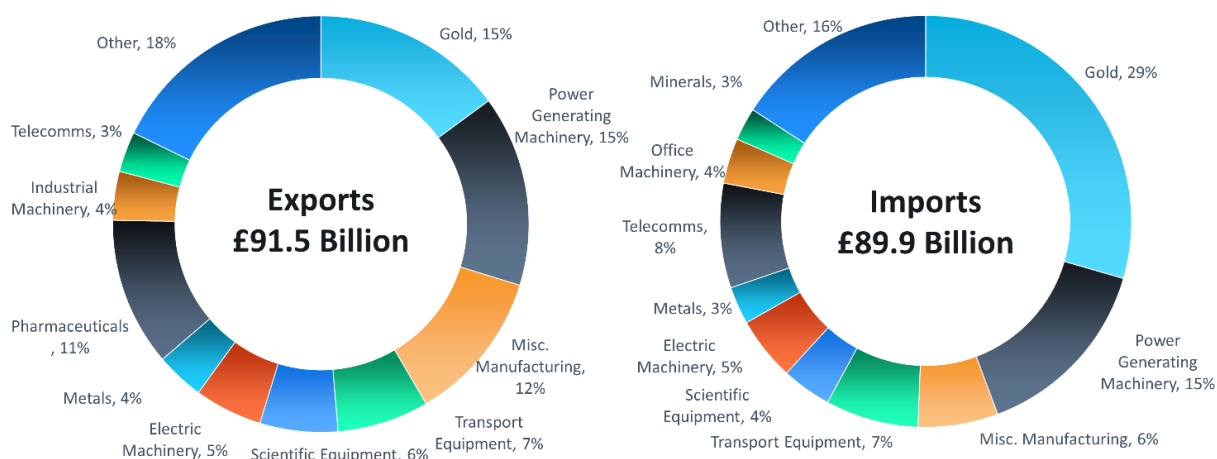
- 4.12 Other high-volume imports include business products including industrial goods, such as electric components and industrial machinery, and consumer goods including mobile phones, flowers and a range of manufactured products.

- 4.13 On the export side, most products with a high share of total volume are high-end manufactured goods, such as pharmaceuticals, cars, books and plane engines, or creative and knowledge industry-based goods such as books and high-end fashion. The notable exception to this is fish, in particular Scottish salmon, which accounted for over 10% of export volumes.



- 4.14 Figure 4.7 shows the UK's exports and imports to all non-EU countries at a 2-digit Standard International Trade Classification (SITC) code level in value terms.

**Figure 4.7: UK non-EU exports and imports at a 2-digit SITC code level, £ Billion (2017)**



Source: HMRC

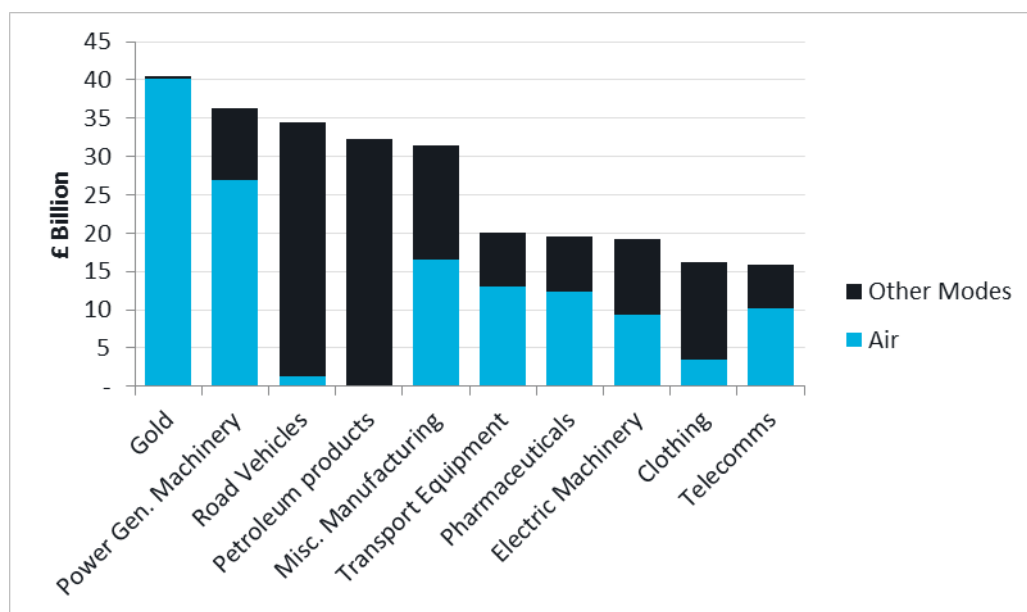
- 4.15 Gold accounts for a significant proportion of import and export value, although it should be noted this is largely driven by the existence of the London Bullion Market, which, accounts for over 80%<sup>7</sup> of the global gold trade. This has a distorting effect on both the value of total imports and exports, as well as the value of trade with certain countries (such as Switzerland with its large gold refining industry).
- 4.16 Many of the other products with a high share of UK trade value, such as aircraft engine parts and power generating machinery, have a high share of both import and export value, likely reflecting the global nature of these industries' supply chains and manufacturing processes. One exception is pharmaceuticals, which account for a significant proportion of export (but not import) value.

#### Products most dependent on air freight

- 4.17 Figure 4.8 shows, at a 2-digit SITC code level, the largest traded product groups by value and the proportion transported by air.

<sup>7</sup> Financial Times

**Figure 4.8: Largest traded product groups at a 2-digit SITC code level, £ Billion (2017)**



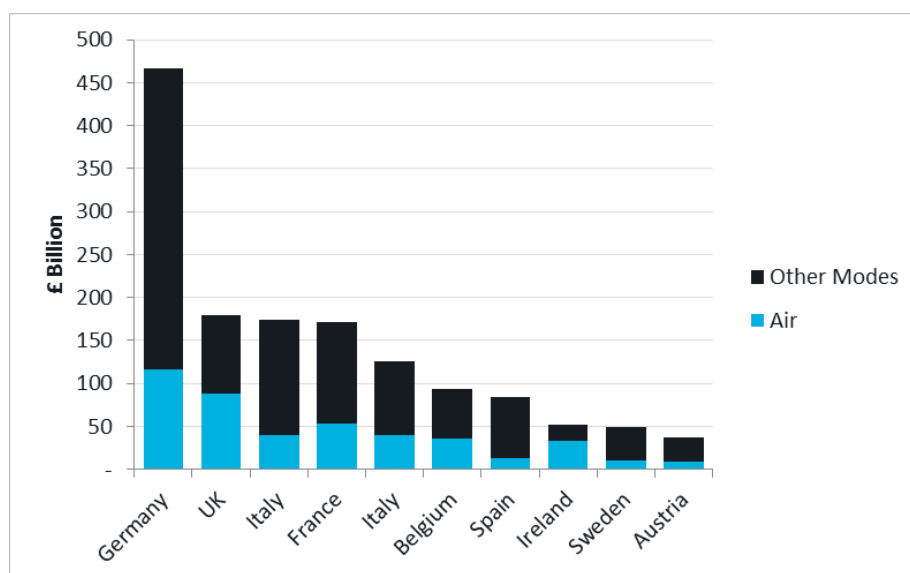
Source: HMRC

- 4.18 In all but three cases (petroleum products (oil), road vehicles and clothing), air accounted for over half of the value of each 2-digit product group. For some product groups, including miscellaneous manufactures, clothing and telecoms, air also accounted for a significantly higher proportion of exports (in value terms) than of imports.

### International comparisons

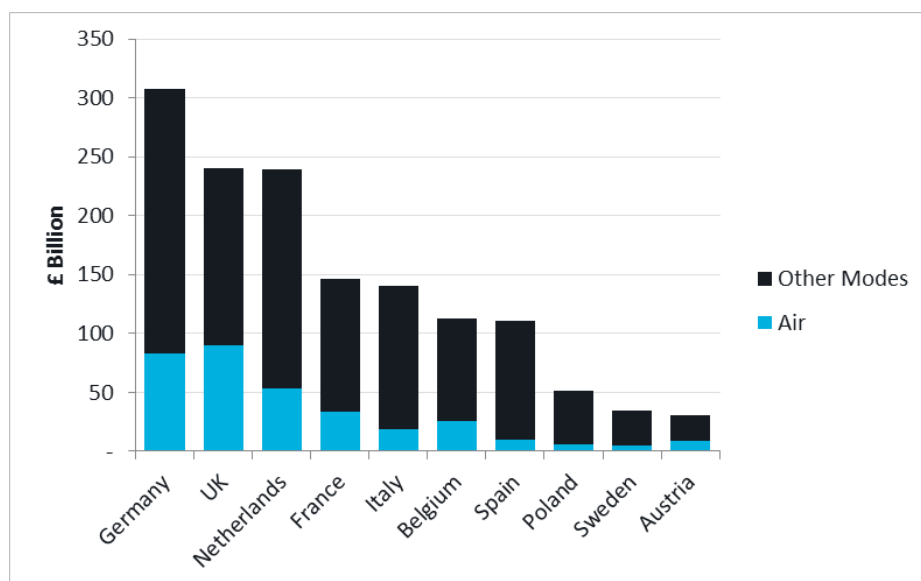
- 4.19 The size of the largest EU import and export markets to non-EU countries in value terms, and the shares transported by air, in 2017 are shown in Figure 4.9 and Figure 4.10 respectively.

**Figure 4.9: Air transport's share of export value in top 10 EU export markets, £ Billion (2017)**



Source: Eurostat – figures have been converted from Euros using an average 2017 exchange rate of €1: £0.88

**Figure 4.10: Air transport's share of import value in top 10 EU import markets, £ Billion (2017)**

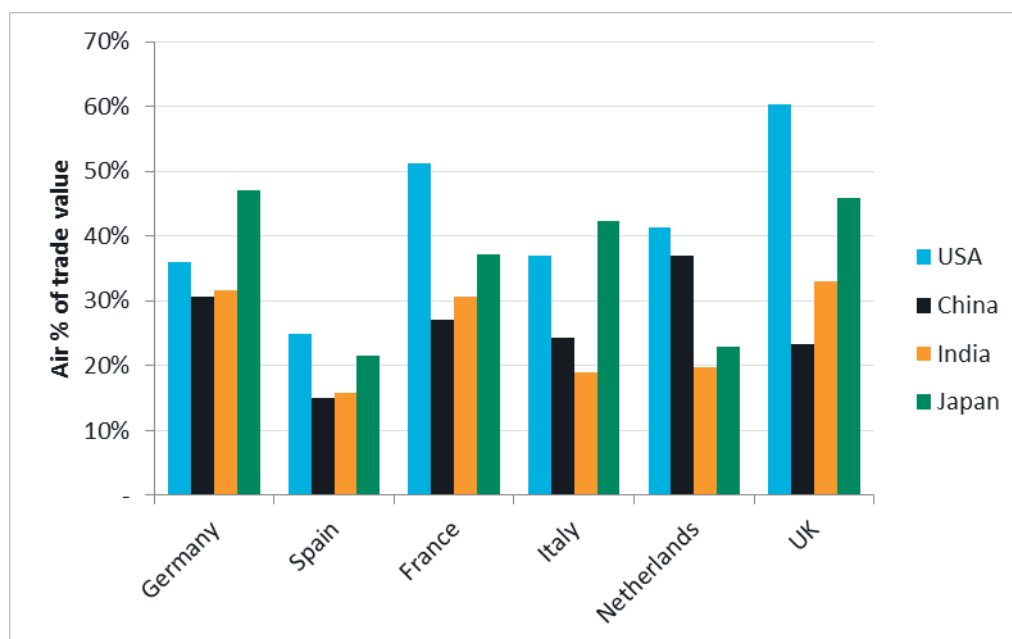


Source: Eurostat— figures have been converted from Euros using an average 2017 exchange rate of €1: £0.88

- 4.20 Although Germany is by far the largest exporter to non-EU countries, only 25% of its goods by value are transported by air, whereas the UK, which is second largest total export market, ships a far higher proportion (49% by value) by air. Most of the other major EU economies ship between 20% and 40% of the value of their non- EU exports by air; only Ireland (64%) ships a greater share of its non-EU exports by air than the UK.
- 4.21 On the import side, the UK is second largest market in the EU and has the highest share (37%<sup>8</sup>) of imports transported by air, which makes its imports by air (£90 billion) the most valuable in the EU. Like the UK, most other major European economies ship lower proportion of their non-EU imports (compared to exports) by air, with most importing 10% to 30% by air in value terms.
- 4.22 The high share of air in non-EU trade for the UK (and Ireland) compared to other EU countries, is likely to be explained to some extent by the fact many countries on continental Europe can ship to some non-EU markets (such as Switzerland, Russia or Turkey) much more easily than UK without using air transport.
- 4.23 Figure 4.11 shows the proportion of trade value transported by air between some of the largest EU and non-EU economies in 2017.

<sup>8</sup> Difference from 35% shown in Figure 4.1 is likely due to slight difference between sources

**Figure 4.11: Proportion of trade value transported by air between selected EU and non-EU countries (2017)**



Source: Eurostat

- 4.24 The share of the UK's trade transported by air with India, Japan and the USA is either the highest (or close to the highest) compared to other major EU economies. In 2017, 60% of the UK's trade value with the USA was transported by air, compared to 51% for France and 36% for Germany. To a large extent, the proportion of trade value between two countries transported by air will be driven by the products the two countries trade, import demand preferences and the strength of each country's export markets.
- 4.25 However, it is likely that, to some extent, the proportion of trade value that is flown by air is linked to the level of air connectivity between the two countries. The UK has significantly more freight capacity to the USA than any other EU country, but has less capacity to China than Germany or the Netherlands. This may partly explain the low relative share of air in UK- China trade value; of the six EU economies shown, only Spain has a lower share of trade value with China that is transported by air.

### Case Study – Pharmaceutical exports

In 2017, the UK exported £13.4 billion's worth of medical and pharmaceutical products<sup>9</sup>, equivalent to just under 90,000 tonnes of goods. In 2017, 79% of the value these products were carried by air, which, as shown in Figure 4.7, represented over 10% of total air export value. Pharmaceutical products are key strategic knowledge-intensive industry for the UK, that benefits internationally from a reputation for high quality standards.

One company that has taken advantage of this reputation is Loughborough-based Morningside Pharmaceutical<sup>10</sup>, which exports supplies to the developing world, to customers including NGOS, ministries of health and private sector clients including hospitals

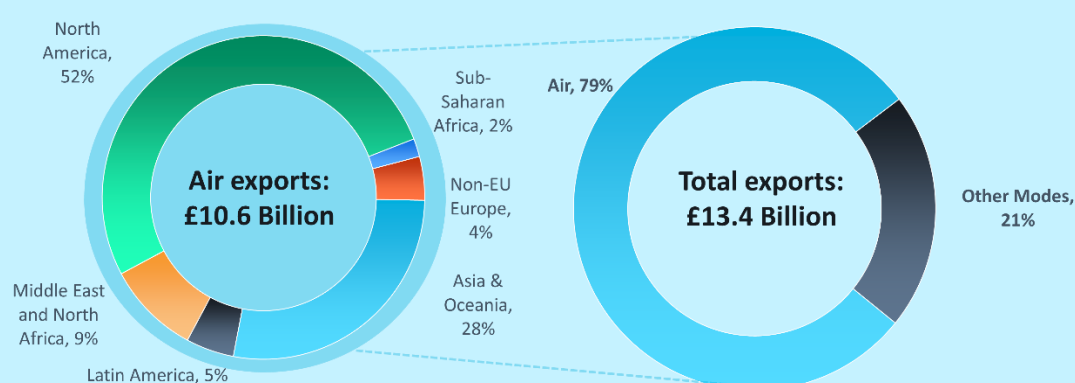
<sup>9</sup> SITC code 54

<sup>10</sup> Credit: East Midlands International Trade Association

and retailers. Shipping by air is more expensive than by sea, however, it enables supplies to be delivered faster; shipments can be delivered to in-land locations in the developing world, such as Harare, within two to three days, compared to 45 to 50 days by sea and road. Many shipments are able to leave from East Midlands airport – 20 minutes away from Morningside's facility in Loughborough. Faster delivery is beneficial for Morningside as it facilitates faster payment.

Although companies like Morningside do most of their business in developing markets in Africa, the majority of UK pharmaceutical exports are to more developed economies, as shown in the figure below. In 2017, over half of air export value was shipped to the USA, while Australia, China and Japan were also important markets.

**Medical and pharmaceutical supplies (SITC 54): Total and by air, £ Billion (2017)**



Source: HMRC

Although it is beneficial for the drugs produced by Morningside to be delivered quickly, other pharmaceutical products are even more time critical. One pharmaceuticals manufacturer of diagnostic and therapeutic medical products, based in South-East England, supplies drugs from their facility, via Heathrow, to hospitals and medical facilities across the world. The drugs have a short life span and are therefore time critical; they must be shipped using express services before they start to degrade.

On the import side, the UK is also a world leader in clinical trials testing, therefore patient urine and blood samples from across the world are sent to the UK in order to develop world class drugs to treat illnesses. The global connectivity provided by Heathrow is therefore important for also facilitating this industry, as samples need to be delivered within 48 hours from collection so as not to compromise the sample integrity. Biological samples are imported (often on dry ice) from countries such as South Africa or Kuwait on direct commercial flights into Heathrow.

## Policy considerations

This chapter demonstrates the importance of air freight to UK international trade, and in particular that the UK has a higher dependence on air freight than most other countries. This raises issues for consideration in the development of the UK Government's Aviation Strategy on the appropriate level of Government support for the air freight sector and how its importance should be reflected as part of the strategy for the aviation sector as a whole.

## 5 Economic analysis

### Introduction

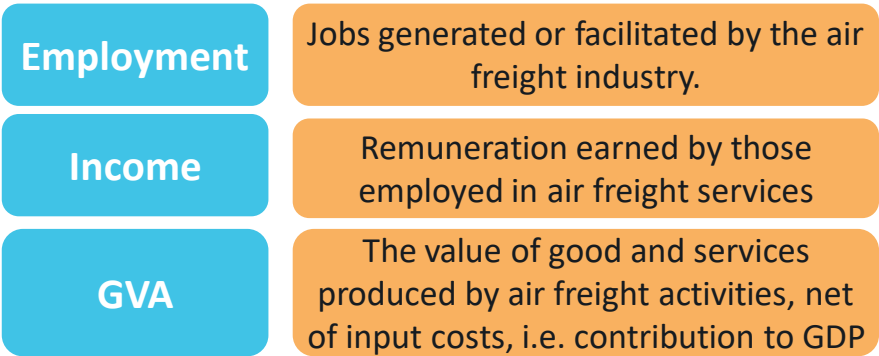
- 5.1 This chapter builds on the analysis earlier in the report to estimate the economic value of air freight to the UK economy. Economic value can be measured in different ways, but typically considers the impacts of an economic sector (or of a proposed project or intervention) on:
- employment (number of employees associated with the sector or intervention);
  - income received as salaries by employees; and
  - gross value added (GVA).
- 5.2 GVA is an important indicator which measures the revenues generated by an industry, after netting off the costs of its inputs, in particular its expenditure on the outputs of other economic sectors or on imports, hence the concept of “value added”. GVA can be measured for both economic sectors and for geographical regions within a country, allowing for comparisons between each of these. When totalled to cover the whole economy at national level, GVA broadly equates to gross domestic product (GDP), the standard measure for national economic output (the difference is an adjustment for taxes and subsidies on products).
- 5.3 The analysis in previous chapters demonstrates the importance of air freight to the UK economy. As noted in paragraph 4.3 above, air freight is the transport mode used in UK external trade (to non-EU countries) for:
- 49% of exports by value;
  - 35% of imports by value; and
  - 41% of combined exports and imports by value.
- 5.4 However, while clearly demonstrating the significance of air freight, these figures do not automatically translate into the measures typically used by economists to estimate the economic value of the sector (employment, income and GVA), which are discussed below.
- 5.5 In this chapter, we consider two different, complementary, approaches to assessing economic value:
- the traditional measure of economic impacts on employment, income and GVA of the air freight industry and associated services, generally known as “direct”, “indirect” and “induced” impacts (based on the activity in the sector itself and on upstream monetary flows between the air freight industry and other sectors in the economy); and
  - the wider economic impacts of air freight, sometimes referred to as “catalytic impacts”, which consider how air freight facilitates economic activity in other sectors (based, in this case, on estimating what proportion of GVA in those sectors is currently reliant on air freight services).
- 5.6 Our approach to the wider economic impacts of air freight also allows us to disaggregate these impacts both by economic sector (to illustrate which industries are most dependent on air

freight) and by the UK regions and constituent countries. This gives important insights into where the economic benefits of air freight are generated, as distinct from the localities from where or to which it is flown (concentrated at Heathrow and three other airports). These approaches are described in the sections below.

Direct, indirect and induced impacts

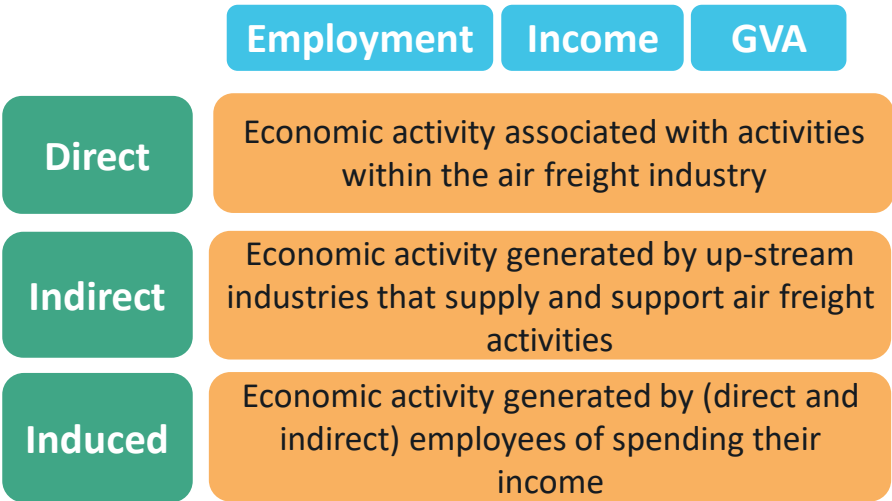
5.7 As noted above, the traditional approach to quantifying the economic impacts of an economic sector is to consider how its activity affects levels of employment, income and GVA, as shown in the diagram below.

Figure 5.1: Measures of economic impact



5.8 For each of these measures, it is possible to compute the “direct”, “indirect” and “induced” impacts using a recognised methodology. In addition, wider, catalytic, impacts can also be estimated (see section below), although the approach for this is less standard. In this section, we focus on the direct, indirect and induced impacts, as shown in the diagram below.

Figure 5.2: Direct, indirect and induced economic impacts



Methodology

5.9 The calculation of direct, indirect and induced economic impacts is based on the use of Input-Output tables (I-O tables), produced by the Office for National Statistics (ONS), the latest available version being from 2014. I-O tables cross-tabulate what each industrial sector purchases from each other industrial sector (intermediate demand), and in addition include

data on household and government expenditure, employees' income and company profit, as well as taxes, capital investment, exports and imports.

5.10 However, I-O tables are only available at a high level of industrial aggregation. In order to isolate the air freight sector, it has therefore been necessary to break down the existing categories into their constituent parts, and then reconstruct the table so that it provides the best representation of the range of air freight-related activities taking place in the economy.

5.11 In order to capture the economic value of air freight, it is important to include all the economic activities relevant to the delivery of air freight services. However, the Standard Industry Classification (SIC) used by ONS classifies as "air freight" (SIC code 51.2) only



the activities related to the scheduled and non-scheduled transport of goods by air, but does not include essential supporting activities such as ground service activities, cargo handling, warehousing and storage. We have therefore developed a wider definition of supporting air freight services, which also includes the following sub-sectors:

- Warehousing and storage facilities (SIC 52.10/2)
- Service activities incidental to air transport (SIC 52.23)
- Cargo handling for air transport act. (SIC 52.24/2)
- Other transport support activities (SIC 52.29).

5.12 Clearly, not all warehousing and storage, or other transport support activities relate to air freight (forwarding, brokerage, etc.), but we have made the assumption that such activities within a given distance of airports will be largely focused on such activities<sup>11</sup>. Based on this assumption and levels of employment in each of the above sub-sectors in wards within these airport "catchments", as compared with overall employment in the sub-sector, we have allocated a proportion of the economic activity in each sub-sector to air freight services. Although this will not capture all aviation-related activity (clearly there will be non-aviation related warehousing near airports, as well as aviation-related warehousing further away), on balance we consider that this approach is reasonable.

5.13 For "service activities incidental to air transport", which includes airport terminals and air traffic control, we have taken a proportion based on air freight's share of overall air transport GVA<sup>12</sup>. Cargo handling for air transport can reasonably be included in its entirety.

5.14 The table below shows the key components of the economic activity for air freight and its supporting services (these correspond to the "direct" impacts).

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<sup>11</sup> Within 10km of Heathrow, within 5km of each of Gatwick, Stansted, Manchester, Birmingham and Glasgow, and within 3km of other airports

<sup>12</sup> 2.6%

**Table 5.1: Air freight and supporting services**

|                                   | Gross Value Added (£m) | Employment (000 jobs) | GVA per worker (£k) | Income generated (£m) | Income per worker (£) |
|-----------------------------------|------------------------|-----------------------|---------------------|-----------------------|-----------------------|
| Air Freight (SIC 51.2)            | 222                    | 3                     | 86                  | 101                   | 38,914                |
| Supporting Air Freight Services   | 1,261                  | 44                    | 29                  | 1,000                 | 22,838                |
| <b>Total Air Freight Services</b> | <b>1,483</b>           | <b>46</b>             | <b>32</b>           | <b>1,101</b>          | <b>23,739</b>         |

Source: ONS data, Steer analysis. 2014 data and prices.

- 5.15 With these adjustments to the ONS 2014 I-O table, we are able to create the underlying data to calculate the direct, indirect and induced economic impacts of air freight and its supporting services. As indicated in Figure 5.2, direct impacts relate to the employment, income and GVA generated by the sector itself, indirect impacts take account of the knock-on effects in the sector's supply chain, while induced impacts also include the impacts of employees' spending in the economy. These can be calculated from the I-O table, by inspection for direct impacts and via standard techniques for the indirect and induced impacts<sup>13</sup>.

## Results

- 5.16 Undertaking the analysis described above allows "multiplier effects" to be calculated. These capture the extent to which changes to air freight services impact the supply chain (indirect impacts) and how the employee income generated by such changes generates knock-on economic activity as this is spent in the wider economy (induced impacts). Multiplier effects are initially calculated for an industry's output, and can then be converted into the corresponding effects on GVA, employment and income. The table below shows the relevant multipliers for (total) air freight services. Note that the multipliers are shown, as is customary, as the overall impact compared to the direct economic impacts (as shown in Table 5.1 above), hence can be considered to be cumulative. The multiplier for direct effects is, by definition, equal to 1.

**Table 5.2: Air freight multiplier effects**

| Multipliers                  | GVA  | Employment | Income |
|------------------------------|------|------------|--------|
| Indirect                     | 2.21 | 1.81       | 1.97   |
| Induced (including indirect) | 4.88 | 3.25       | 3.69   |

Source: ONS, Steer analysis

- 5.17 Applying these multipliers to the direct impacts leads to the economic impacts shown in the table below.

**Table 5.3: Economic impact of air freight services**

| Impacts      | GVA (£m)     | Employment ('000s) | Income (£m)  |
|--------------|--------------|--------------------|--------------|
| Direct       | 1,483        | 46                 | 1,101        |
| Indirect     | 1,800        | 38                 | 1,067        |
| Induced      | 3,949        | 66                 | 1,891        |
| <b>Total</b> | <b>7,232</b> | <b>151</b>         | <b>4,059</b> |

Source: ONS, Steer analysis. 2014 data and prices.

<sup>13</sup> Using Leontief I (indirect) and Leontief II (induced) matrix inversions

- 5.18 Overall, air freight services support GVA of **£7.2 billion, 151,000 jobs** and associated income of **£4.1 billion** (2014 data and prices) in the UK economy. Note that this result only relates to activities and expenditure either within the air freight and supporting industries, its supply chain and spending by its workforce. It does not include “downstream” effects, i.e. the effect on the industries purchasing air freight services, or the wider, catalytic, impacts on the whole economy. These are discussed in the next section.

## Wider economic impacts

- 5.19 Traditional economic impact assessments are based on the monetary interactions between each sector of the economy with other sectors, as well as with its workforce (salaries), the government (taxation), owners (dividends) and interactions with suppliers and purchasers outside the country (imports and exports).
- 5.20 However, air freight is a low margin business where the actual revenues earned from supplying air freight services (whether the actual flying or support activities such as ground handling and warehousing) do not fully represent either the value of what is being flown, or the value of timely delivery. In terms of the value of what is flown, air freight imports and exports, between them, were worth £181 billion (2017 values and prices)<sup>14</sup>, or close to 25 times more than the economic added value (GVA) calculated using the direct, indirect and induced methodology of the previous section.
- 5.21 Additionally, beyond the value of the goods transported by air, some products are worth considerably more to the shippers/consignees of the goods than the value of the item itself. This explains why so much machinery and equipment, as well as contractual and legal documents, are delivered using air freight. The items themselves may not be particularly valuable, but a key component may allow a production line to continue to operate rather than being shut down while the component is delivered by surface transport. Similarly, key original signed documents may allow deals worth billions of pounds to go ahead.
- 5.22 While the value of goods flown (exports and imports) cannot be directly compared with an economic value measure such as GVA, because their worth is not “added value” in the same sense that the activities of an industry add value, the two concepts are linked. We have therefore developed an approach to identify how much value added across the economy is associated with the value of products moved by air.

## Methodology

- 5.23 Each sector of the economy produces outputs for which customers are willing to pay. While service industries produce largely intangible outputs, primary and secondary sectors produce physical products such as food, machine parts, cars and so on. For these sectors of the economy, their outputs equate to particular commodities so that, for example, farms produce agricultural products while automotive plants produce cars and trucks. Hence, there is a correspondence between each industry and its outputs<sup>15</sup>.

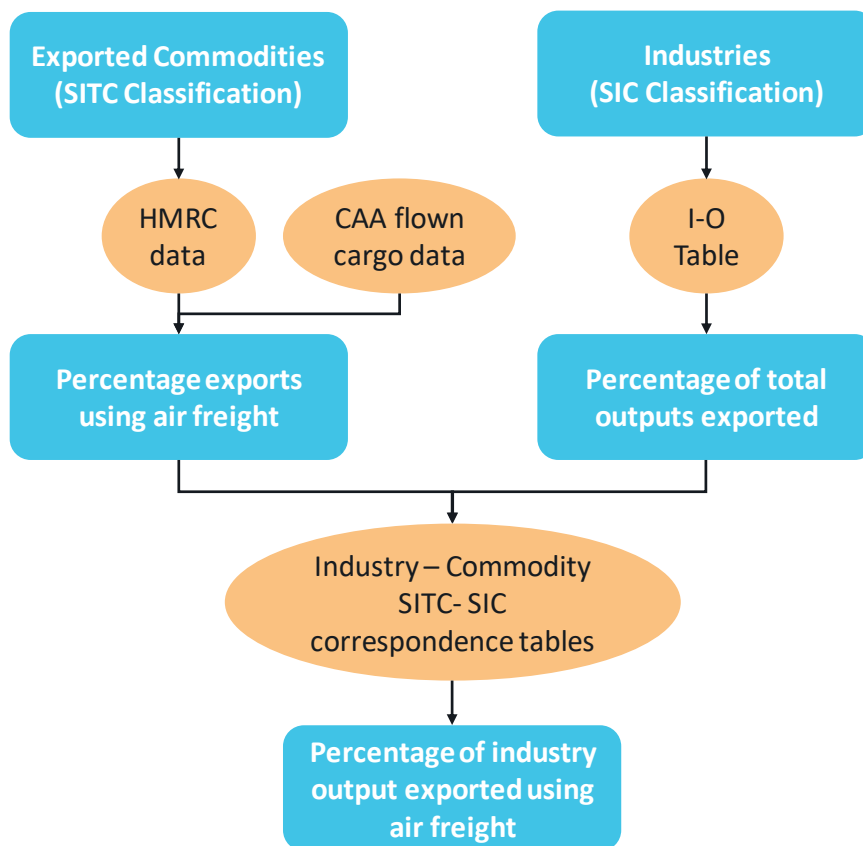
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<sup>14</sup> See Figure 4.7 above

<sup>15</sup> This correspondence is formally available using tables provided by Eurostat RAMON relating Standard International Trade Classification (SITC) commodity codes and Standard Industry Classification (SIC) codes, together with mappings between different versions of each set of codes provided by ONS and UNSD.

- 5.24 As identified in Chapter 4 and illustrated in Figure 4.8 above, for a number of commodities air freight plays a significant role in delivering exports of the product (the majority for pharmaceuticals and power generating equipment, for example), as identified by HMRC data on transport mode used for trade. Using the HMRC data, we can therefore identify what proportion of such industries' exports are transported by air. Furthermore, for each industry, the I-O table developed by ONS and described from paragraph 5.9 above, identifies the value of exports produced by each industry in relation to the total value of its output. Bringing these together by using the correspondence between industries and the commodities those industries produce, we can therefore establish, for each industry which produces physical outputs, what proportion of those outputs is represented by exports transported using air freight services. The approach is illustrated in the figure below.

**Figure 5.3: Estimation of industry output exported using air freight**



Source: HMRC data downloads, ONS weighted correlation tables, Eurostat RAMON, UNSD SITC Rev. 4, CAA airport data, Steer analysis

- 5.25 Note that because HMRC data covers only non-EU exports, an adjustment needs to be made to account for EU exports by air. In volume terms (tonnage), air freight flown to the EU represents 18.3% of total air freight from the UK, based on CAA flown volumes data<sup>16</sup>, so total

<sup>16</sup> CAA 2017 airport data (Table 14)

air freight export values can be estimated from non-EU exports by uplifting the value of non-EU exports by 22.3%<sup>17</sup>.

5.26 An industry's output represents the value of the goods (or services) that it sells, while its value added (measured by GVA), broadly represents the value of outputs net of the cost of inputs<sup>18</sup>. For this reason, GVA, summed across the whole economy, with an adjustment for product taxes and subsidies, represents the whole national economic output (whereas adding all industries' outputs together would double-count the portions of output sold from one industry to another).



5.27 It is reasonable to make the assumption that all output contributes equally to the GVA generated by an industry. For example, based on the 2014 I-O Table, SIC 26, the "Manufacture of computer, electronic and optical products" generated £20.6 billion in output (sales) and its GVA was £7.9 billion. We therefore assume that each £1 million of output from these industries generate a GVA of £383,000.

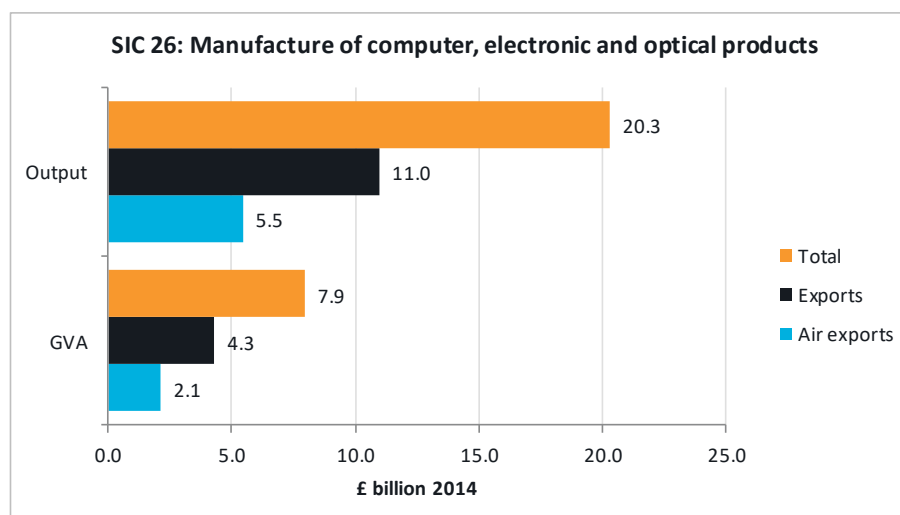
5.28 We have also made the assumption that, since its exports represent a component of an industry's output and also contribute directly to the value added (GVA) of that industry, that:

- The proportion of an industry's GVA supported by air freight services is equal to the proportion of its outputs which are exported by air.

5.29 In the case of computer, electronic and optical products, using the analysis based on the approach in Figure 5.3, 54.2% of the value of the relevant industries outputs are exported, and of these, 49.5% are exported by air (EU and non-EU combined). Therefore 27.3% of the industries' outputs, or £5.5 billion's worth of sales, are exported by air. Using the assumption that each unit of output generates the same level of GVA, we can therefore deduce that 27.3% of the GVA generated by the industries producing computer, electronic and optical products is, currently, dependent on the use of air freight services. This equates to 27.3% of the industries' combined GVA of £7.9 billion, or £2.1 billion. Note that this represents the "direct" GVA of the industries themselves, and not any knock-on effects on their supply chains. This direct GVA to output relationship is illustrated in the figure below.

<sup>17</sup> The 22% uplift is calculated from  $[1 / (100\% - 18.3\%)] - 1$ , and by making the assumption that the commodity value per kg of EU exports using air freight is similar to the value per kg of non-EU air freight.

<sup>18</sup> Some adjustments are made for consistency across industries which sell different proportions of outputs to other industries rather than to consumers or the public sector, so GVA for an industry is actually calculated as the sum of employees' compensation, taxes on production and its gross operating surplus. At a national level, the two approaches are equivalent.

**Figure 5.4: Illustration of relationship of industry output and GVA related to exports by air, £ Billions**

Source: ONS, HMRC, Eurostat, CAA, Steer analysis

- 5.30 The final step in this analysis is to recognise that, if a portion of an industry's GVA is dependent on air freight services, then the suppliers who provide inputs to that industry are also dependent on the air freight services. This is the same "knock-on effect" described in paragraph 5.15 above. Following this logic, it is reasonable to apply the industry multipliers for indirect and induced impacts generated from analysis of the ONS I-O table. While Table 5.2 above shows the relevant multipliers for the air freight sector, each different industry sector has its own multiplier<sup>19</sup>. The multipliers are shown, for each sector with air exports, at the single-character industry section level, in the table below.

**Table 5.4: Industry sector induced effects multipliers**

| Code | Industry sector   | Induced multiplier |
|------|---|--------------------|
| A    | Agriculture, Forestry and Fishing                                   | 3.3                |
| B    | Mining and Quarrying  | 2.4                |
| C    | Manufacturing   | 3.9                |
| E    | Water Supply; Sewerage, Waste Management and Remediation Activities | 3.0                |
| H    | Transportation and Storage  | 4.0                |
| J    | Information and Communication                                       | 3.0                |
| M    | Professional, Scientific and Technical Activities                   | 3.0                |
| R    | Arts, Entertainment and Recreation                                  | 2.8                |

Source: ONS, Steer analysis

- 5.31 In the example of the industries manufacturing computer, electronic and optical products, the application of the multiplier for manufacturing (code C), which is 3.9, increases the estimate of GVA dependent on air freight exports from £2.1 billion to £8.3 billion.

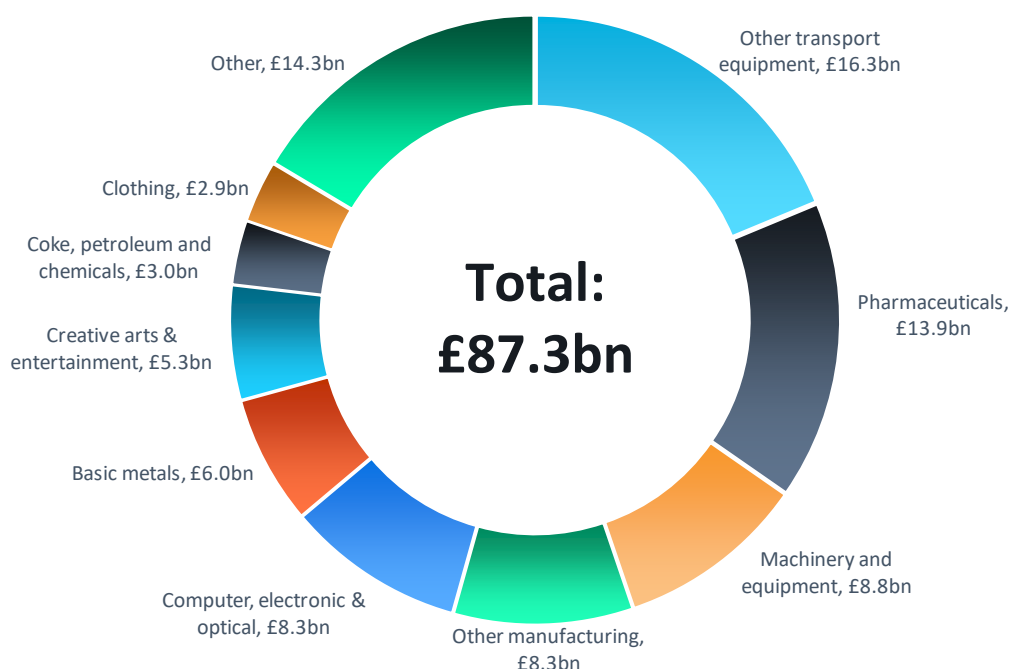
<sup>19</sup> These are estimated by the same Leontief matrix inversion approach on the I-O table used to find the air freight multipliers

- 5.32 This approach leads to analysis that implies that a very significant proportion of some industries' GVA is dependent on air freight. While this is factually true at the current time, it is also necessary to consider the possibility that the exports currently transported by air could be transported by other modes (i.e. land or sea), and hence that this dependency is purely contingent, because substitute transport options exist. In the absence of air freight, some products might be transported via other modes and could not, therefore, be considered "dependent" in the strictest sense.
- 5.33 However, while it is true that all products which are currently transported by air could, in principle, be transported by surface modes, air transport is qualitatively very different in its characteristics, because:
- transit times are very much faster (e.g. one week for bulk air freight from the Far East, vs. six weeks by sea); and
  - prices are very much higher (in a range of four to six times more expensive for bulk air freight, and higher still for express freight).
- 5.34 Therefore, surface modes would appear to be poor substitutes for air freight. Clearly, if air freight became less available and/or more expensive, some users would switch to surface transport. However, it is likely that they would become less competitive by doing so as, if not, they would already have made the switch. Therefore, in the longer run, such industries would tend to migrate away from the UK to other locations where air freight was more readily available and/or cheaper. For example, manufacturing plants which depend on air freight for their supply chains, and particularly to ensure continuous operation when parts fail, would be less efficient if surface transport had to be used, and hence corporations would be less likely to invest in such plants located in the UK.
- 5.35 For this reason, while the proportion of GVA dependent on air freight estimated using this approach may be reduced through the substitution of other modes, we consider that much of the GVA currently dependent on air freight is likely to remain so in future. Hence, any factors making air freight less convenient, less available or more expensive, are likely to have a negative impact on the industries generating this portion of GVA.

## Results

- 5.36 Using the approach above, we have estimated the level of GVA currently dependent on air freight across the economy. Figure 5.5 below shows the industry sectors with the highest level of GVA currently dependent on air freight exports (including the contribution of their supply chains). The GVA figures are based on ONS' latest release (2016) of figures disaggregated at an industrial and regional level.

**Figure 5.5: GVA currently dependent on air freight by industry, £ Billion**



Source: ONS, HMRC, Eurostat, CAA, Steer analysis, 2016 values and prices

5.37 The chart shows that £16.3 billion of the GVA generated by the industries producing “Other transport equipment” (SIC 30) is currently dependent on air freight exports (including the contribution of their supply chains). Similarly, £13.9 billion of the GVA of the pharmaceutical industry (and its supply chain) is currently dependent on air freight exports. Across all sectors of the economy, **£87.3 billion of GVA is currently dependent on air freight exports**. This represents **5% of the total GVA measure of national output** (£1,747 billion in 2016).

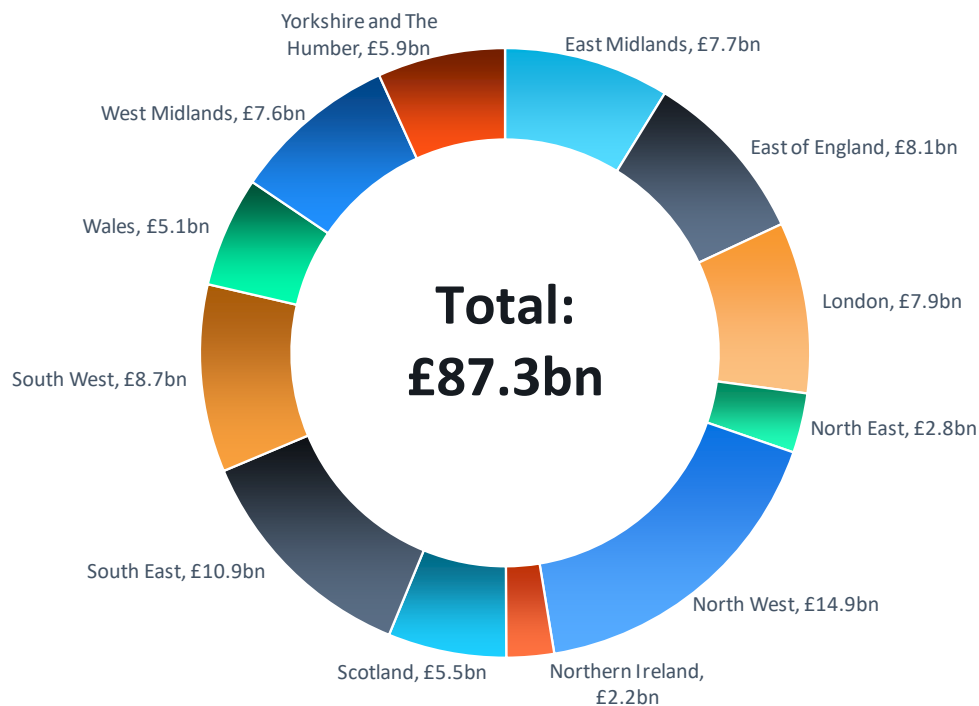
5.38 While the level of GVA currently dependent on air freight might potentially be reduced through the use of alternative modes of transport, the fact that such alternatives are generally poor substitutes for air freight indicates that the level of GVA dependent on air freight is likely to remain significant. This indicates that air freight is a very important service supporting a significant fraction of national economic activity.

### Regional economic impacts

5.39 The analysis of the level of industries’ and their supply chains’ added value (GVA) which is currently dependent on air freight, enables us to estimate the regional importance of air freight services, by considering the regional distribution of output for each industry (and making the reasonable assumption that the proportion of air freight exports, compared with outputs, is the same for each industry across the different regions).

5.40 Figure 5.6 below shows the distribution of the £87.3 billion of GVA currently dependent on air freight exports across the UK’s regions. Note that, unlike flown cargo data statistics, this data represents the origin of the air freight (i.e. where it is manufactured) rather than the region of the airport from which it is flown.

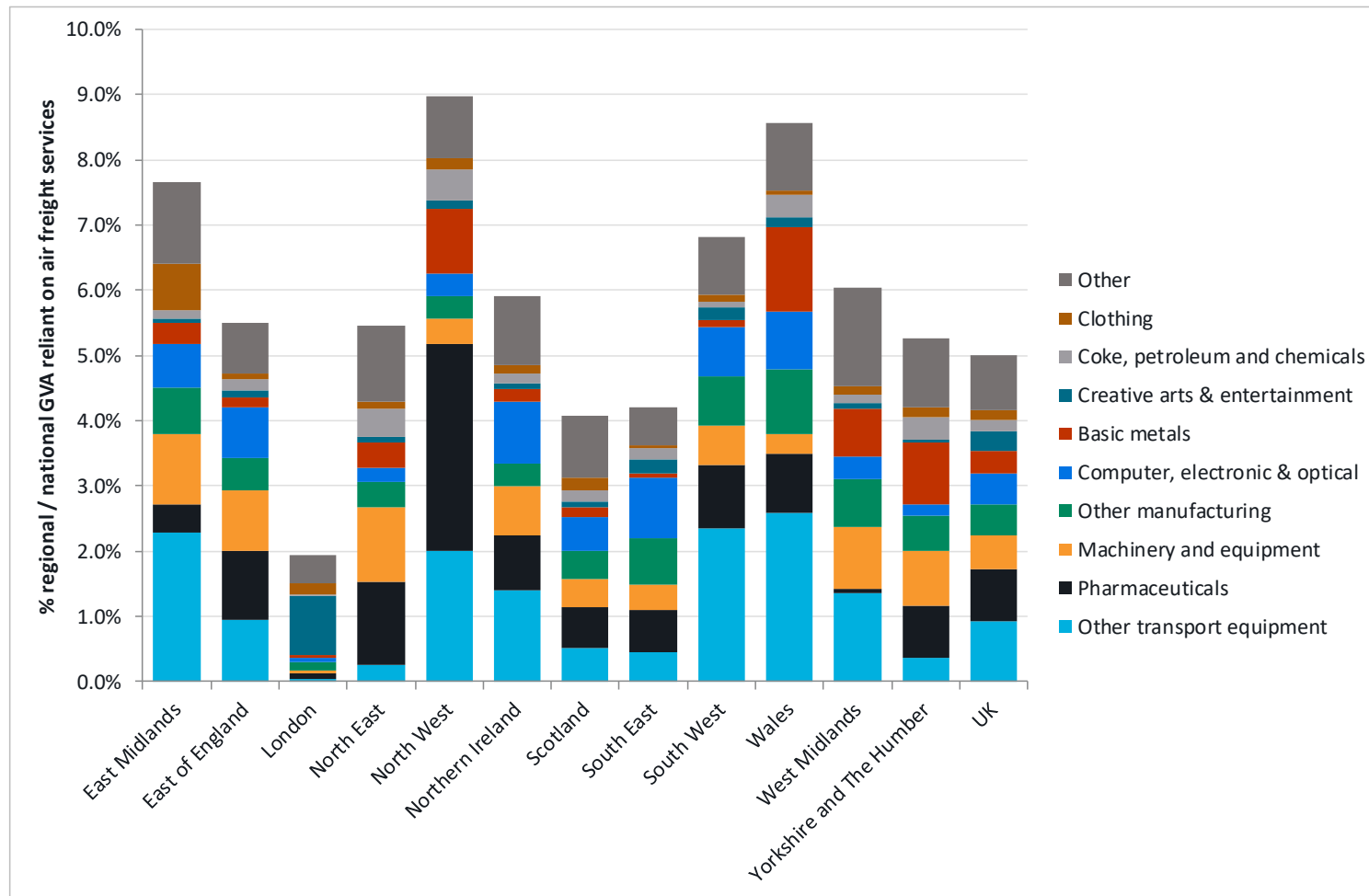
**Figure 5.6: GVA currently dependent on air freight by region, £ Billion**



Source: ONS, HMRC, Eurostat, CAA, Steer analysis, 2016 values and prices

- 5.41 Figure 5.6 demonstrates the importance of the air freight industry in the North West, where £14.9 billion GVA is currently dependent on air freight, representing 9.0% of the whole economy of the region. Similarly, air freight supports very significant proportions of economic activity in many UK regions and nations, including 8.6% in Wales, 7.6% in the East Midlands, 6.8% in the South West, 6.0% in the West Midlands and 5.9% in Northern Ireland. Note that some of these regions have insignificant levels of actual air freight volumes flying from their airports, despite the importance of air freight to their economies, implying a reliance on surface transport to reach airports located elsewhere in the country.
- 5.42 Taking a combined view of both regions and the industries within them whose GVA is currently dependent on air freight provides some interesting insights, as illustrated in Figure 5.7 below.

Figure 5.7: Proportion of GVA currently dependent on air freight by region and industry



Source: ONS, HMRC, Eurostat, CAA, Steer analysis, 2016 values and prices

- 5.43 Figure 5.7 highlights the importance of air freight to transport equipment producing industries in the East Midlands, the North West, the South West and Wales, while pharmaceutical manufacturing in the North West makes very significant use of air freight as well as (to a lesser extent) in other regions. Machinery, equipment and other manufacturing in many regions are supported by air freight, while basic metal industries in Wales, the North West, West Midlands and Yorkshire are also dependent on it.
- 5.44 Air freight does not support much of the production of the London region, which is unsurprising since it is in general not a manufacturing region, but London's large creative arts sector is seen to be strongly dependent on air freight services.
- 5.45 The contrast between the importance of London and the South East in terms of providing air freight services (focused on Heathrow), compared with the relatively low dependence of their economies on the sector in comparison to regions such as the North West, Wales, the East Midlands and the South West, is stark.



### Case study – Connectivity at Manchester Airport

Several stakeholders consulted as part of this study have stated that, due to the concentration of air freight activity at Heathrow, UK air freight would benefit from greater utilisation of regional capacity. The recent growth in freight volumes at Manchester, enabled by increased intercontinental connectivity, have demonstrated how utilisation on regional capacity can benefit UK air freight and regional exports.

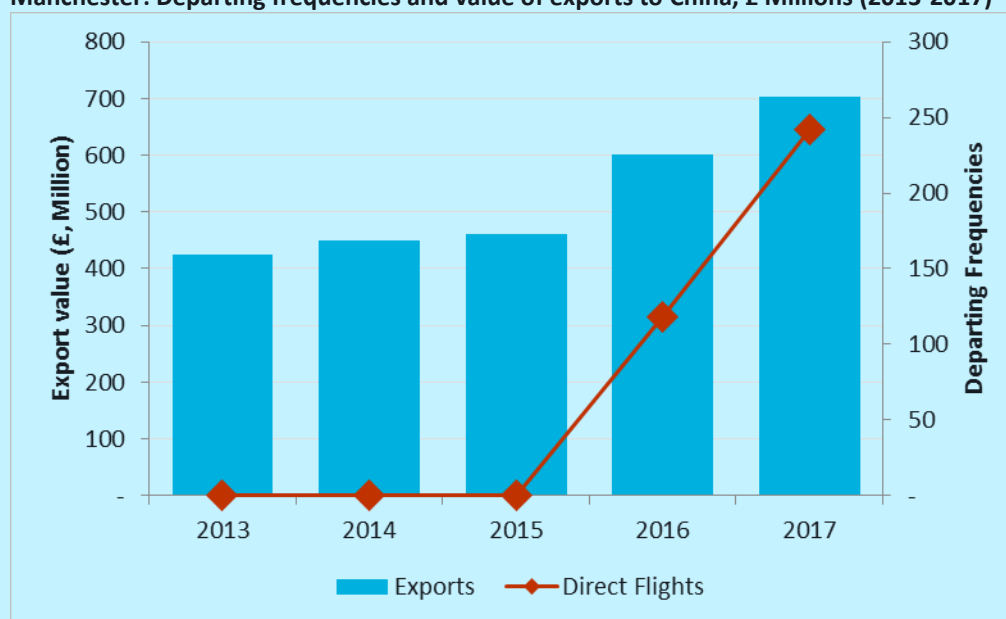
Prior to the financial crisis, freighters accounted for a significant amount of volume at Manchester. Although freighter volumes have fallen away since the financial crisis, increased intercontinental frequencies on passenger aircraft have driven a significant increase in bellyhold freight volumes since 2009. Bellyhold volumes at Manchester have increased with a CAGR of +8.5% between 2009 and 2017.

Bellyhold freight volumes have grown in line with the number of annual departing frequencies to the UAE and Qatar, which have more than doubled since 2009. In more recent years, bellyhold volumes have also been boosted by new direct connections to Hong Kong (2014), Saudi Arabia (2014), Singapore (2016), China (2016) and Oman (2017).

Connections on these new routes accounted for over 15% of freight volumes in 2017. The wider benefits of the China connection were explored in a recent report<sup>20</sup>.

As well as increasing freight volumes, these new connections have also facilitated exports flown from Manchester Airport. Although some of the routes are to global freight hubs, such as Hong Kong and Singapore, and have therefore not materially affected exports to these countries, other routes have significantly increased the value of exports shipped from the airport. The figure below shows the value of exports to China flown from Manchester Airport as well as the number of annual departing frequencies. The value of exports flown to China from Manchester Airport increased by close to £300 million in the two years since direct frequencies to Beijing were introduced. The exports to other countries have also increased; the value of exports to Oman increased 5-fold by over £40 million the year direct frequencies were introduced.

**Manchester: Departing frequencies and value of exports to China, £ Millions (2013-2017)**



Source: OAG, HMRC

The direct connection to Beijing in some cases also appears to have aided exporters in North-West England. Although total exports to China from the UK grew strongly in 2016 and 2017 (recovering from a slump in Chinese trade in 2015), the value of some products exported to China have grown especially strongly since 2015. HMRC's Regional Trade Statistics (RTS) do not disaggregate exports by transport mode; but there has been strong growth in the value of some exports from the North West, in some products that are transported predominately by air.

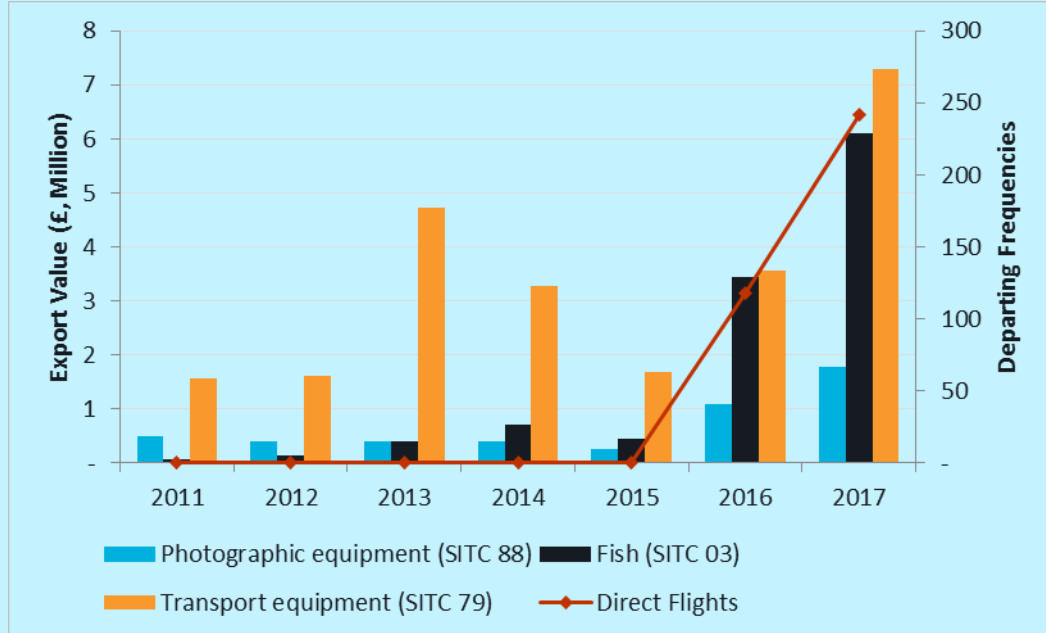
The figure below shows the growth in export value from the North-West region to China, for selected product groups that have over a 70% share of air exports nationally, and the number of departing direct flights from Manchester Airport to China. The value of exports

<sup>20</sup> *The China Dividend: Two Years In*, Steer Economic Development, at:

<https://mediacentre.manchesterairport.co.uk/new-report-shows-manchester---beijing-service-is-a-major-catalyst-for-the-northern-economy/>

to China from the North West, in these product groups, have increased significantly in the years since the direct flight to Beijing was introduced.

**Manchester: Departing frequencies and value of North West exports to China, £m (2011-2017)**



Source: OAG, HMRC

Direct connections to other countries also appear to have benefited local exports; after a new direct connection to Muscat in 2017, the value of exports flown from Manchester Airport to Oman increased 5-fold by over £40 million with export values of flown products from the North West also increased significantly.

The increased freight volumes and export values flown from Manchester demonstrate that long-haul connections served by non-UK carriers, can be a catalyst for the utilisation of regional airport capacity, can help mitigate the decline in freighter activity and can boost exports from regional airports. Given the capacity constraints at Heathrow and that, as of 2017 compared to other major European countries, the UK has relatively few connections with China and the Far East, these markets represent significant opportunity to grow freight capacity.

## Policy considerations

5.56 This chapter demonstrates the importance of air freight to the UK economy as a whole, as well as to particular economic sectors and to certain UK regions and nations. Taking account of the analysis of the industry in previous chapters, this raises particular issues relevant to the formulation of national aviation policy as the UK Government develops an aviation strategy towards 2050, including:

- how to protect and develop the significant share of the UK economy currently dependent on air freight services; and
- how to support UK regions and nations whose economies are heavily dependent on air freight services, particularly where local airports do not currently benefit from strong air freight services.

## Control Information

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**Prepared by**

Steer  
28-32 Upper Ground  
London SE1 9PD  
+44 20 7910 5000  
www.steergroup.com

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**Prepared for**

Airlines UK  
25 Southampton Buildings  
London  
WC2A 1AL

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**Author/originator**

Mark Scott

---

**Reviewer/approver**

Peter Wiener

---

**Other contributors**

Cameron Ades, Daniyal Labib, Jake Cartmell

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