Review of the Economic Value of Night Flights at Heathrow

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1 Introduction

The Heathrow Association for the Control of Aircraft Noise (HACAN) has asked CE Delft to review the report "The economic value of Night flight at Heathrow" by Oxford Economics. Oxford Economics attempts to estimate the economic benefits in terms of value added, employment and tax revenues of night flights at Heathrow Airport in this economic impact study, as well as the costs of a possible ban on night flights. It also carries out a critical assessment of a report by CE Delft from 2011 ("Ban on night flights at Heathrow Airport; A quick scan Social Cost Benefit Analysis") in which the economic benefits of night flights at Heathrow were confronted with their societal costs.

Below we present a more detailed assessment of the report by Oxford Economics. Here we state the following reasons why the estimated impacts of a ban on night flights are excessive:

- All night-time employment is unjustly assigned to activities relating to night flights.
- Clock-in rates are used to measure nighttime employment even though they are much higher than actual hours worked at night.
- Part of the value added of foreign airliners is incorrectly added to UK GDP.
- Daytime employment and added value of the second leg of a transfer flight is incorrectly assigned to nighttime employment and added value.
- Night-time employment and added value of non-airliner entities is presumably counted twice.
- The impacts and losses refer to *gross* impacts and not to *net* impacts on the economy.
- Air connectivity is not affected by a ban on night flights, hence the catalytic effects will be much smaller than reported.
- The scenario's on the ban on night flights contain several unrealistic assumptions.

2 The economic value of night flights at Heathrow

Oxford Economics presents estimates of the direct, indirect and induced benefits for the U.K. economy of all flights during the Night Quota Period (NQP; 23:30 to 6:00) and the Night Period (23:00 to 7:00) at Heathrow airport in the report. The economic benefits add up to £ 342 million of added value, 6,600 jobs and £ 64 million in tax revenues during the NQP and £ 543 million of added value, 6,800 jobs and £ 102 million in tax revenues during the night period.

Losses as result of a ban on flights during the NQP amount to 2,800 jobs and £ 178 million in added value lost in the UK per year, whereas a ban on all night flights leads to losses of 11,900 jobs and £ 813 million in UK GDP. If so-called catalytic effects are taken into account as well, total losses amount to a staggering £ 1,3 billion in the case of the less restrictive ban and £ 7,0 billion in 2021 in the case of a ban on all night flights.

We will discuss the way in which Oxford Economics derives these benefits and losses and present arguments and factual evidence why these figures are unrealistically high.

3 Economic benefits

The direct benefits of night flights relate to the additional employment, value added and tax revenues at Heathrow which can be attributed to air traffic during the night. Oxford Economics uses a 'bottom-up' approach to derive the benefits.

Direct employment

Total employment at Heathrow is assigned to night flight and non-night-flight activity based on the reported number of hours worked at night by all personnel. Employment during the day due to the transfer leg of night flight is added to this figure. This leads to an estimate of 3,199 jobs during the NQP (4,4% of all employment) and 6,775 jobs during the night (9,3%).

Oxford Economics makes use of 2007 employment figures, as this was the last year prior to the economic downturn. This is fair, because BAA employment data for 2011, which were not available when the report was written, shows that employment at Heathrow has risen from 73,000 in 2007 to 76,500 in 2011. In assigning total employment to night-time activity however, Oxford Economics incorrectly assumes that hours worked during the night are attributable to night flights.

Oxford Economics acknowledges the fact that some night-time employees (e.g. cleaners) carry out activities that are not related to night flights. At the same time, they contend that crew and cabin personnel (who make up about one-third of all employment) of night flights clock in at an earlier time, so that the estimate of night-time employment could even be on the conservative side. CE Delft does not subscribe to this view.

First, night-time employment is usually kept at a bare minimum at airports, primarily because of higher wage costs on night-shifts. Aside from crew and cabin personnel and some key-personnel (e.g. border control, traffic control, baggage handlers), few if any employees work during the night because of air traffic, nor will they lose their jobs if a ban is imposed.[1]

Second, employees who work in the daytime clock in early as well, and even more so than nighttime personnel clocking in during the day, as more air traffic takes place during the day. This is evident from Table A2-2 in the report where the clock-in rates are at their highest between 5:00 and 7:00.

Both considerations would lead to a substantial reduction in the direct employment estimates even when the rise in employment in the intermediary period is taken into account.

We also feel that Oxford Economics' decision to add employment as part of the daytime transfer leg to the estimate of night-time employment is unwarranted. The rationale given is that the day leg is dependent upon the night arrival or departure. This is a valid view, but one can use the same logic to subtract employment from the night period and append this to the day period, because departures and arrivals in the night depend on arrivals and departures during the daytime. We suspect that this choice also leads to bias in the estimated employment losses (see under scenario analysis).

[1] A night flight ban could even lead to additional benefits as key-services may currently operate at a loss during the night.

Direct added value

Direct added value is calculated based on wage costs and earnings per passenger or 100 kg of cargo for UK aircraft operators. This value added per Work-load Unit is further differentiated between type of carrier (UK or foreign) and origin/destination of flight (long or short haul). The added value of non-airline entities - calculated as number of employees of these entities employed during the night times their productivity - per WLU is appended to this figure. The added value of night flights is then obtained by multiplying the value added per WLU for each category of flight with night-time air traffic that occurred in the period July 2010-June 2011. Direct added value then amounts to £ 158 million during the NQP and £ 543 million during the entire night.

Although Oxford Economics mentions that it adheres to a strict definition of night flight dependency in calculating the impact, they do stretch the boundaries in favour of night-time activity and further cloud the discussion by presenting possible impacts of night flights, which are not taken up because of data problems, but are meant to highlight the fact that the estimates are on the conservative side. In our opinion, this is definitely not the case.

First, the added value of night flights is in part based on the activity on the day leg of the arrival when departure takes place during the night and vice versa. This transferal amounts to £ 24 million or 15,2% of total added value during the NQP and £ 90 million or 19,8% of total added value during the night. If full mitigation on the part of airliners during the daytime would take place, then no losses need to be incurred as a result of a ban on night flights, yet some losses would show up in Oxford Economics' estimate (see under scenario analysis).

Second, the added value of foreign operators is responsible for 17,9% of estimated added value in the NQP and 25% in the night. Oxford Economics states that because 12,5% of personnel of British Airways and Virgin Atlantic is foreign, 12,5% of personnel of the competitors on night flights must be British residents. Turning our attention to these competitors (Cathay Pacific, Singapore Airlines, Malaysia Airlines), considering the vast distance between their respective home bases and the U.K and noting that the 12,5% figure refers to all foreign employees of British operators and not just Chinese, Singaporese or Malayans, the presumed reciprocity in employment between foreign and UK operators is unrealistic.[2]

Third, the night-time added value of non-airliner entities, which is appended to the added value of airliners, may not be actually attributable to night flights, for reasons given earlier under the header of direct employment. We do not know what share of added value of non-airliners is attributable to night flights. Based on the negligible share of British crew on foreign airliners and the reasonable assumption that daytime added value should not be transferred to nighttime added value, a more accurate estimate for direct added value would be at least 30% lower for the NQP and 45% lower for the night than Oxford Economics' estimates.

Indirect and induced impacts

Indirect impacts relate to employment and value added generated in the supply chain of Heathrow due to the direct benefits of night flights. Induced impacts relate to employment and value generated by spending of employees and companies who profit directly or indirectly from the night flights.

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[2] It is known what percentage of cabin crew of Cathay Pacific is British: less than 2%.

The indirect and induced benefits are calculated by means of multipliers on the direct benefits; these multipliers were obtained from a study by Oxford Economics done in 2006 ('The Economic Contribution of the aviation sector in the U.K.'). The indirect and induced benefits amount to an additional 3,400 jobs and £ 342 in added value during the NQP period, and 11,900 jobs and £ 644 in added value during the entire night.

The upward bias in the estimates of the direct benefits carries over to the estimates of indirect and induced benefits. If we next turn our attention to the multipliers we note two further causes for bias. Oxford Economics employs multipliers of 2.09 for direct, indirect and induced employment and 2.16 for direct, indirect and induced added value based on input-output analysis that they carried out in 2006. This figure is an average in the aviation literature, where multipliers for gross added value lie in the range of 1,7 to 2,5 (R. Caves, Towards sustainable aviation, 2003).

These multipliers were however calculated with the aviation industry in mind. Indirect impacts in this case refer to impacts which are generated in the supply chain of the aviation industry. The activity of non-airliner entities at airports is an indirect impact of aviation and as such presumably a part of the multiplier used in Oxford Economics' analysis. In the case of Heathrow however, indirect impacts refer to off-site impacts. The activity of non-airliner entities is counted as a direct impact, but it is presumably contained in the multiplier as well. If no allowance is made for this double counting of non-airliner activities, and the report does not mention anything about this problem, then the estimates of the indirect and induced effects are of course inflated.

The multipliers are also subject to a common misperception: they refer to *gross* impacts and not to *net* impacts.

The employment multipliers for instance, measure the impact in the unlikely case that none of the personnel employed during the night is reinstated elsewhere by their employer or able to find another job, so that they all become unemployed after the ban on night flights. This assumption is highly unrealistic. In the same way that Heathrow attracts personnel who were formerly employed at other airports or in other sectors of the economy, cancellation of flights does not produce the one-on-one loss in jobs and added value implied by the multipliers.

We do not know the exact size of the net impacts, yet a common practice in Dutch infrastructural investment literature is that about half of all direct, indirect and induced impacts lead to 'crowding-out' or 'crowding-in' effects on the labour market and the other half constitutes net impacts. If gross added value is at least 30% lower during the NQP and 45% lower during the night than Oxford Economics' estimates, than net added value would be about 65% lower during the NQP to 72,5% lower during the night period, without even making amends for the double-counting of nighttime activities of non-airliners.

Tax revenues

Tax revenues are calculated based on the Air Passenger Duties of departing passengers, the income taxes and national insurance contributions from direct, indirect and induced night-time employment and corporation taxes (a fixed share of direct, indirect and induced value added) paid by airlines, the airport operator and other companies who benefit from night flights. Tax revenues amount to £ 37 million during the NQP and £ 102 million during the night.

The upward bias in the estimation of night-time employment and added value, the multipliers and the value added attributable to non-airliner entities will of course inflate the estimates of tax revenues attributable to night flights at Heathrow and tax losses because of a ban on night flights. Furthermore, the tax revenues are estimated on a *gross* basis and not a *net* basis.

Catalytic effects

Catalytic effects relate to a wide range of second- and third-order effects on the U.K. economy, due to impacts of more tourism, trade, foreign investment and the likes. The report by Oxford Economics presents several examples of the catalytic effects of air traffic. It is stated that they add up to £ 1,1 during the NQP and £ 6,2 billion during the entire night in the year 2021. These estimates are based on the 2006 study by Oxford Economics in which the long-run relation between total factor productivity (i.e. proxy for technological change) and the business usage of aviation was estimated.

The problem in the 2011 report is that this relationship is presented as a causal relation; a bold statement that the 2006 report wisely refrains from. The relationship between productivity and aviation remains unclear: more aviation could lead to improvements in productivity, productivity increases might lead to more aviation through for instance the trade channel or productivity and aviation may move in the same direction because of a third factor (e.g. a sectoral shift towards highly productive exporting sectors).

Oxford Economics further refers to a 2006 study by InterVISTAS on the relation between air connectivity and catalytic effects. Like most research on the subject, the regression in that report does not take account of the causality either. In simple terms: the results of the study can be interpreted in a way that better connectivity leads to increases in employment, investments and productivity, but it could be the case that cities with better employment and investment opportunities are more able to improve their air connectivity or that some third factor (i.e. population growth) is the real driver for both connectivity and the catalytic effects.

Hence connectivity, tourism and the supply-side performance of the economy are related somehow, although one does not necessarily lead to the other. The problem with the interpretation in the report by Oxford Economics is that less air traffic in the night does not necessarily mean that connectivity is affected. Air connectivity refers to the ability to fly from one city to another city. What a ban on night flights does, is to increase travel times and to cause passengers and cargo to depart or arrive at suboptimal times. These constitute welfare losses in their own right, but they do not impair connectivity. The catalytic effects simply have no place in the report, unless flights between London and key destinations are cancelled altogether because of the ban on night flights.

Scenario analysis

A ban on night flights may lead to a variety of responses by airline operators: a transfer of flights to Gatwick, rescheduling of flights to day time slots at Heathrow, the diversion of flights to hubs on the continent with the use of transfer flights to the U.K. and the cancellation of flights altogether. All these responses lead to economic losses according to Oxford Economics. A ban on night flights would lead to losses of £ 76 to 372 million in added value, 900 to 3,700 jobs and £ 41 to 158 million in tax revenues, depending upon the severity of the ban and the response of airliners.

Oxford Economics does not go into detail into how the losses are calculated for each scenario. We must therefore appraise the scenario's to say something more about the viability of the estimated losses.

Night-time flights that are cancelled because they cannot be rescheduled during the daytime, cannot be transferred to Gatwick or cannot be replaced by connecting flights from other European hubs as well as day-time flights that are cancelled because they are 'cannibalised' by rescheduled nighttime flights do constitute certain losses. These flights constitute 37% of the loss in jobs and 22% of the loss in added value for the ban during the NQP and 64% of the loss in jobs and 60% of the loss in added value for the ban during the entire night.

A transferal of flights to Gatwick also leads to certain losses as Gatwick is not a hub and does not offer passengers the possibility to transfer to another flight. At the same time it is assumed that freight and mail on these flights is reduced by 45%. We do not see why cargo should be affected this heavily, unless this figure refers to cargo that needs to be transferred abroad. Cargo intended for the UK needs to be transported to the UK either by air or other means of transport, so without a proper explanation why cargo should be nearly halved, we do not think that this constitutes a real loss to the economy.

Oxford Economics mentions that Heathrow currently operates at full capacity, so that rescheduling during the daytime presents severe problems. The flight data shown to prove this in the report, was taken during the busy summer period, so rescheduling should be less of a problem during the remainder of the year. Moreover, while the number of flights may not be increased any further, the number of passengers may to the extent that larger aircraft can be used. Lee et al. ('Noise Exposure Contours for Heathrow Airport 2011', CAA, 2012) show that over 300 out of 1,200 flights on an average summer day at LHR are either regional aircraft or the smallest types of single aisle aircraft (A318, B737-300, etc.). Probably growth in passenger numbers is possible by using larger aircraft. Some airliners may cannibalise on existing daytime slots during the summer, losing traffic on the replaced day-flights. Yet losses in transfer traffic and cargo are expected on the rescheduled flights as well. We do not see how this can be the case, especially since the presumed reduction in the number of flights should increase the utilisation rate on the remaining flights.

As mentioned before, Oxford Economics assigns employment and added value on the departing or arriving leg during the day to night-time employment and added value. If one night-flight is cancelled and another rescheduled during the day (without cannibalisation), losses should be related to the cancellation of the first flight only. Yet Oxford Economics' estimate of employment and added value still contains the additional impact of the day leg on the second flight. The transferal of daytime activity to night flights will only produce an accurate estimate of actual losses if all night flights are cancelled, whereas any mitigation on the part of airline operators leads to upward bias of the estimated losses.

Because all the estimated losses are based on the estimates of direct, indirect and induced effects, we also know that they are heavily inflated due to the assignment of all night-time activity to night flights, the use of clock-in rates as a (poor) proxy for night-time employment, the inclusion of value added of foreign airliners, the double counting of night-time employment and added value of non-airliner entities and the fact that the effects constitute gross rather than net impacts on the economy.