Bloomberg
NEW ENERGY FINANCE

25 October 2011

EU ETS - RESEARCH NOTE

Contents

Including aviation in the EU ETS - the burning question

The potential inclusion of aviation in the European carbon trading scheme continues to be highly contentious with ongoing law suits and threats of trade sanctions. Amongst the war of words hugely varying figures have been produced on the possible financial impact on the aviation sector. This Research Note reviews the evidence to date and provides an independent assessment of the likely effects on the industry.

- Published estimates of costs to the aviation industry from inclusion in the EU Emissions Trading Scheme (EU ETS) have varied from €18bn loss to a €20bn gain over 2012 to 2020.
- Our analysis shows that at current carbon prices the "out-of-pocket" costs faced by the aviation industry under the EU ETS are small compared to other costs the industry has to contend with. They represent less than a quarter of a percent of revenue from the routes covered by the EU ETS in 2012 and around half a percent in 2020. Specifically:
  - The aviation industry will face a deficit in emission allowances of around 35% of its expected emissions throughout the course of 2012 to 2020.
  - At current carbon prices this translates to an "out-of-pocket" cost of €762m in 2012 and €2,170m in 2020. These costs reduce to €629m in 2012 and €2135m in 2020 when the capacity to import cheaper international carbon offsets (CERs) are taken into account.
  - They are also dwarfed by other recent costs applied to aviation in Europe – the UK Air Passenger Duty (APD) and the German Air Passenger Tax (APT). Out-of-pocket costs of the EU ETS in 2012 represent 1.4% of the UK APD and 5% of the German APT.
- Two factors prevent full cost pass-through to consumers: (i) competition from non EU ETS regulated operators on some international routes, (ii) potential contraction in demand from higher prices. We estimate that non EU ETS regulated competition will limit full cost pass-through on around 10% of routes. In terms of demand response we estimate that because of the wide geography covered by the EU ETS, any reduction in demand will be less than the increase in price.
- In the short term it will also be more difficult for some operators to pass on costs due to a high proportion of fixed costs. Over time though the economic value of all carbon allowances should feed through into operational and pricing decisions.
- In our opinion, in the long run covered airlines should be able to pass through around 60% of the combined out-of-pocket and opportunity costs. This is more than the out-of-pocket costs of buying allowances. In the short run we estimate the airlines will be able to pass through around 30% of the combined costs. This is just under the full out-of-pocket costs.
- There will certainly also be winners and losers within the industry as the ability to pass on costs will vary by route flown and customer profile. We have not looked at the distribution of costs and benefits as part of this analysis.

1. INTRODUCTION

The planned inclusion of aviation into the EU Emissions Trading Scheme (EU ETS) from 1 January 2012 has become a highly contentious topic in recent months. On the one side, the European Union is committed to regulating air travel in line with other sources of greenhouse gases. On the other side, the aviation sector is fiercely opposed to such a move, claiming the costs would be excessive and is in the process of legal action against the Commission.

Amid this acrimony facts and figures appear to have become distorted with extreme cases being produced by both sides. For example the International Aviation Transport Association (IATA[1]) claims a €17.7bn cost of compliance over the 2012-20 period, while the European Commission[2] estimates that there will be a €20.0bn profit to the industry over the same period. Other analysts such as S&P have forecast a €1.1bn cost to the industry in 2012.

The purpose of this note is to provide an objective assessment of the costs to the aviation industry of its inclusion in the EU ETS.

Many of the published studies, some by reputable analysts, are questionable in their objectivity as they have been sponsored by one side or the other - although one would hope the reports from governments have been scrutinised in some degree for lack of bias. Other comments in the media have also been based on partial analysis and possibly led to misleading interpretations.

These extreme positions may be intended to sway those of influence, but may also serve to whip up popular support for their cause. Either way they are unhelpful for decision-makers trying to obtain an objective assessment of the consequences of including aviation in the scheme. The purpose of this note by Bloomberg New Energy Finance is to provide an independent and objective assessment of the costs to the aviation industry of its inclusion in the EU ETS.

The note considers three key questions:

- How many EUAs will the aviation sector have to buy under the scheme?
- What will be the out-of-pocket costs of buying these allowances?
- How able is the industry to pass on these costs, and potentially benefit from the pricing in of all carbon allowances?

2. THE AVIATION DEFICIT

The shortfall faced by the aviation sector – on the basis of the currently proposed legislation - is the difference between projected emissions from all departing and arriving flights into and out of Europe, and the sector's free allocation.

Our assumptions on aviation demand growth show emissions increasing by 19% from 252Mt in 2012 to 299Mt in 2020. These projections take into account increases in demand for aviation travel as well as improvements in the energy efficiency of the planes. They do not take into account feedback on air travel demand as a result of any increase in ticket prices caused by the EU ETS.

In terms of the total allocation associated with the aviation sector this has been set at 97% of the average of 2004-06 emissions for 2012, and at 95% of the average of 2004-06 emissions for the 2013-20 period. This however includes free allocation volumes, New Entrant Reserve (NER) volumes and auctioned allowances. What is important for the financial impact on the sector is the distribution of free allowances. We have included the NER within the free allocation in the subsequent calculations.

The free allocation volume to airlines has been set at 85% of the overall aviation allocation in 2012 (182.6Mt/yr) and 82% over the 2013-20 period (172.5Mt/yr). The annual free allocation is

[1] http://greenaironline.com/news.php?viewStory=1341
[2] http://ec.europa.eu/clima/policies/transport/aviation/documentation_en.htm

then split between the airlines using an industry wide benchmark figure that was published by the European Commission on 26 September 2011. Some 3% of the free allocation is set aside for New Entrants in Phase III but this does not change the total free allocation for the sector.

Between 2012 and 2020 the industry will face a shortfall in allowances of around 35% from its expected emissions.

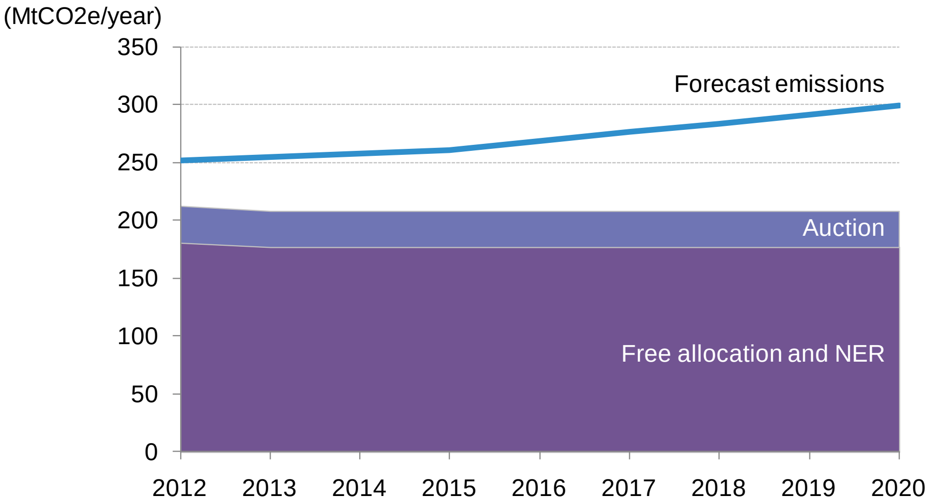
The proportion of allowances obtained for free by each airline will decrease through time as total industry emissions are expected to grow whilst the free allocation volume will remain constant. Table 1 and Figure 1 summarise the deficit faced by the sector. This increases from 28% of expected emissions in 2012 to 41% in 2020. On average over the period the industry will face a shortfall of around 35% from its expected emissions.

Table 1: Aviation demand relative to free allocation (assuming no demand destruction)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2012-20
Forecast Emissions	252	254	258	261	269	276	283	291	299	2,442
Free Allocation *	181	177	177	177	177	177	177	177	177	1,599
Deficit	71	77	80	84	91	99	106	114	121	844
% of forecast emissions	**28%**	**30%**	**31%**	**32%**	**34%**	**36%**	**37%**	**39%**	**41%**	**35%**

Source: Bloomberg New Energy Finance. Note including New Entrant Reserve*

Figure 1: Forecast emissions and allocation to the aviation industry



Source: Bloomberg New Energy Finance

3. COSTS TO THE AVIATION INDUSTRY

3.1. "Out-of-pocket" costs

"Out-of-pocket" costs are those required by airlines to pay for the emissions deficit by acquiring EU ETS eligible allowances. This is a function of the size of the deficit and the price of purchased allowances. The expected shortfall is shown above. At the time of writing the market price of EUAs is around €10/t. For the purpose of this analysis we show three price trajectories for the price of allowances.

- The low price uses an assumption that the EUA market falls to €8/tCO2 and rises at a 4% cost of carry through until 2020.
- The medium price uses the current forward curve of the market
- The high price uses the Bloomberg New Energy Finance central price forecast, which assumes a continuation of the EU ETS beyond 2020 and consequently sees prices rise towards the end of Phase III as the market anticipates the need for abatement in Phase IV.

At current market prices annual out-of-pocket costs would be €762m in 2012.

The results are shown in Table 2. In 2012 out-of-pocket costs for the aviation industry covered by the EU ETS could vary between €567m and €1,130m, corresponding to €8/tCO2 and €15.9/tCO2 carbon prices respectively. By 2020 with a carbon price of €11/t the deficit would cost around €1,330m and with a carbon price of €50/t as much as €6,280m. Using current market prices and forward curves (Medium Scenario), out-of-pocket costs rise from €762m in 2012 to €2,170m in 2020. All figures are in nominal terms.

Table 2: Out-of-pocket costs to the aviation industry of the EU ETS (€m)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2012-20
EUA Price (€/t)										
Low	8.0	8.3	8.6	9.0	9.4	9.7	10.1	10.5	10.9	
Medium	10.7	11.5	12.2	13.3	14.2	15.0	16.0	16.9	17.9	
High	15.9	20.9	26.2	31.9	36.7	41.5	45.3	48.3	51.7	
Costs (€m)										
Low	567	642	696	754	856	960	1,074	1,197	1,330	8,076
Medium	762	890	986	1,111	1,295	1,488	1,697	1,923	2,170	12,321
High	1,130	1,615	2,112	2,668	3,356	4,090	4,808	5,489	6,280	31,549

Source: Bloomberg New Energy Finance. Note figures in nominal terms. Costs assume single EUA price and do not allow for CER imports.

3.2. Carbon costs in context

To get a sense of the scale of these costs - even without assuming any recovery through increasing prices – they need to be compared with a measure of the size of the air travel business covered by the EU ETS. Table 3 shows the out-of-pocket cost to the aviation industry in comparison to its revenue and its fuel cost under the low, medium and high price scenarios.

Key assumptions

In this analysis the revenue and fuel costs relate to the routes flown that are covered by the EU ETS – ie all internal flights in Europe and international flights arriving and departing to and from a European airport. Revenue and fuel costs have been estimated through the relationship between revenue and fuel consumption and CO2 emissions. Although revenue will differ by route and company, on average across the industry, there is clearly a relationship between CO2 emissions, fuel burn, passengers carried and revenue.

Fuel consumption is related to CO2 emissions by an assumed combustion efficiency and carbon content of the fuel. On average 0.3175 tonnes of jet fuel produces one tonne of CO2. Fuel costs assume the current market price of USD 1,000 per tonne of fuel and increase this at 3% per year out to 2020.

Revenue attributable to the routes covered by the EU ETS is estimated by calculating the ratio of fuel costs to revenue in 2010 using a sample of 24 airlines, namely Aer Lingus, Aeroflot, Air Berlin, Air France, Deutsche Lufthansa, EasyJet, Finnair, Air Iberia, Norwegian Air Shuttle, Ryanair, SAS, TAP, Turk Hava and Vueling Airlines. This shows that across these airlines, fuel costs account for an average of around 23% of revenue.

The price of carbon in this analysis is the average of the forward EUA and CER prices, weighted in line with the import allowance that airlines have to purchase CERs over the 2012-20 period. This mostly affects 2012 when airlines are able to import CERs up to 15% of the aviation cap. After 2012 the import limit is reduced to 1.5% of the cap. Finally, future revenue growth was assumed in all regions to be 3% annually.

In 2012 out-of-pocket CO2 costs will represent 0.2% of EU ETS covered airline revenue

Table 3: Out-of-pocket EU ETS costs in comparison to revenue and fuel costs (€m)

	2012			2020		
	low	Medium	High	low	medium	high
CO2 costs (€m)	460	629	913	1,308	2,135	6,205
Revenue (€m)	262,076			393,826		
CO2 as % of revenue	0.18%	0.24%	0.35%	0.33%	0.54%	1.56%
Fuel costs (€m)	60,277			90,580		
CO2 as % of fuel costs	0.76%	1.04%	1.51%	1.44%	2.36%	6.85%

Source: Bloomberg New Energy Finance. Low, Medium and High scenarios relate to price trajectories assumed in Table 2.

On the basis of the above analysis, we estimate that in 2012 the out-of-pocket costs of purchasing carbon allowances will represent 0.24% of the EU ETS-covered airline revenue under the Medium Scenario (ie current market prices). This will increase to 0.54% by 2020 as the deficit of demand over free allocation increases. By 2020, if EUA prices were to rise to around €50/t and CERs were priced at the same percentage discount to EUAs, out-of-pocket EU ETS costs would represent 1.56% of revenue.

In terms of fuel costs, out-of-pocket costs of the EU ETS would represent 1.0% of the annual fuel bill of air routes covered by the EU ETS at current market prices. This percentage will increase to 2.4% by 2020. Under the high price scenario, out-of-pocket carbon costs would represent 1.6% of fuel costs in 2012 and 6.85% in 2020.

Comparison with other costs

Although the sums implied by the EU ETS look large in absolute terms they are clearly small in comparison to revenue at current market prices, and are significantly smaller than many other variables the airline industry has to contend with.

Jet fuel costs have increased by 250% over the past 5 years

For example, although out-of-pocket carbon costs will increase from 1.0% to 2.4% of fuel costs by 2020 (at current carbon price forward curves), oil prices themselves have increased by over 250% between the lowest and highest points over the last five years, and have swung by +/-65% around the average price over this period.

The price of carbon is also dwarfed by air charges such as the UK's Air Passenger Duty (APD) and the German Air Passenger Tax (APT). The UK APD applies a charge per passenger for flights departing from a UK airport of between £24 (€28) and £170 (€195) depending on the length and destination of the flight.

At current market prices the EU ETS represents 1.4% of the UK APD for a flight from London to New York.

For example, the UK APD for a flight from London to New York now costs £120 (€138). In contrast the out-of-pocket cost of carbon for a flight from London to New York at current carbon market prices is of the order of €2 – ie 1.4% of the APD.[3] The German APT applies a charge of between €8 and €45 per passenger, again depending on the flight's length and destination.

Comparison with airline profits

Whilst the out-of-pocket costs of the EU ETS as a proportion of revenue are very small, they are no doubt more significant as a proportion of profits. Figure 2 compares the inter quartile range (from the 25th to the 75th percentile) for major airlines and the top 10 EU power generators since 2008. Generators are shown for comparison because they are the largest sector covered by the EU ETS and have been scrutinised for the effect the EU ETS has had on profits.

[3] Assumes Boeing 747 aircraft with 80% occupancy, with current carbon price of €10/tCO2.

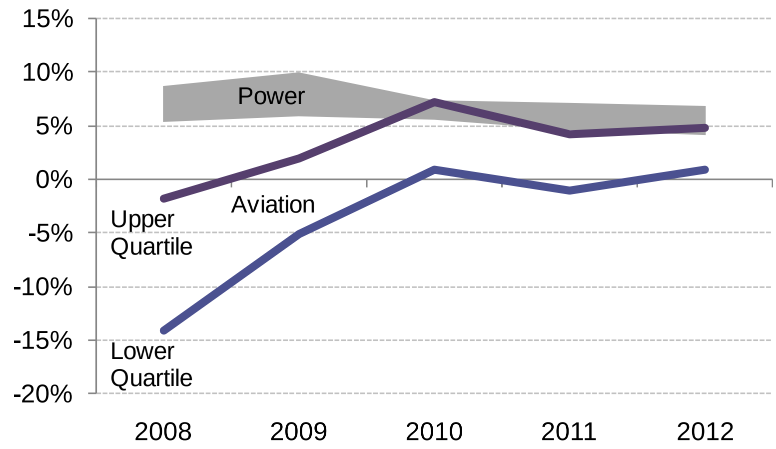
Airlines suffered particularly badly during the recession in 2008 and 2009 when only the most profitable airlines broke even, while most major power generators were making over 5% net profit. Of the airlines Ryanair has consistently achieved the highest profit margins, of around 10% net profit/sales, but most other airlines have struggled financially.

Chronic low profitability in the industry suggest deeper structural problems

Low levels of profitability however are not new to the airline industry. Many airlines, especially national flag carriers, have failed to provide decent returns for many years. So even though an increase in any cost looks severe in the context of limited profits, there are clearly more important issues facing the industry. These concerns relate to chronic over-capacity on some routes, barriers to mergers and acquisitions, implicit government support and restrictions in competition for airport access and air space.

Figure 2: Inter quartile profitability for major airlines and EU power generators

Net income/revenue



Source: Bloomberg. Note: 2012 figure is average of analyst estimates. Includes the following airlines: BA, Air Iberia, Air France, Deutsche Lufthansa, Ryanair, Delta Air, AMR Corp, US Airways, Air Canada, Air Berlin, Air China, Nippon Airlines, Cathay Pacific, Singapore Airlines, Korean Air, China Southern, China Eastern, Jet Airways.

The figures presented above are a maximum possible cost on the industry. Any industry facing the same costs will seek to pass through the additional costs in the form of higher customer prices, or lower prices paid to suppliers. The scope for this cost pass-through is explored below.

4. ABILITY TO PASS THROUGH COSTS

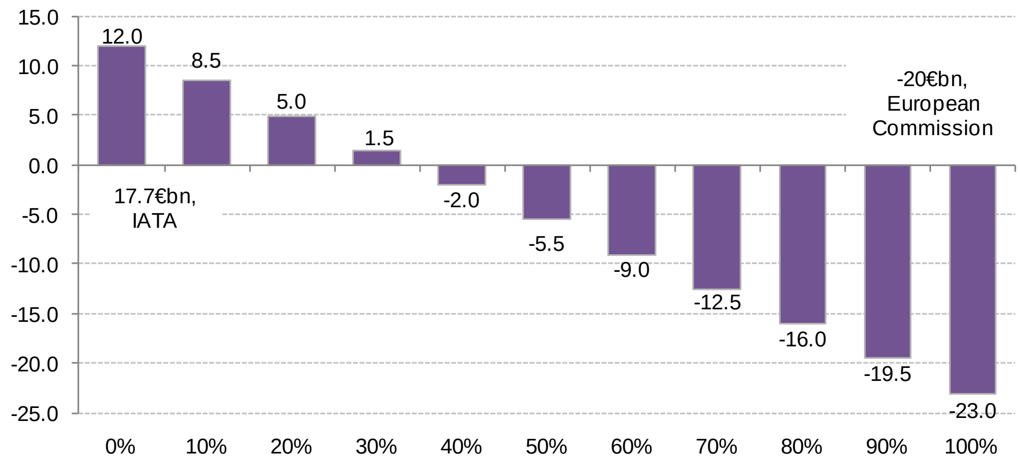
While the shortfall of the airline industry is a relatively straightforward calculation, the extent to which the price of carbon can be passed through into ticket prices is subject to much debate. It is contentious because if airlines are able to pass through the full cost of carbon into ticket prices and demand was relatively inflexible then not only would they be able to recover the out-of-pocket costs but also the "opportunity cost" of the free allowances (for explanation of opportunity cost, see section 4.1). This would see the airlines profiting from the scheme rather than the scheme adding costs.

The literature shows widely varying assumptions on the ability of the aviation to pass through costs

For example, IATA has appeared to allow for no pass-through in its statement that the EU ETS would cost the industry €17.7bn over the period 2012 to 2020 (€2bn/yr). The European Commission on the other hand has assumed full cost pass-through in estimating that the industry would benefit from inclusion in the scheme by around €20bn over the same period.

Figure 3 shows the range of costs that could be incurred by the airline industry under different pass through assumptions. The pass-through rates refer to the proportion of total carbon costs applied to all carbon allowances consumed – ie the out-of-pocket costs and the freely allocated allowances. If one assumes that demand for air travel is unchanged by higher ticket prices, airlines would therefore need to pass on 30 - 40% of the cost of an EUA for the scheme to be revenue neutral in the period 2013 to 2020. The key question is “is this realistic”?

Figure 3: Cost of carbon to airlines at different pass-through rates, 2012-20 (€bn)



Source: Bloomberg New Energy Finance. Assumes current market prices for CO2.

Because of the importance of this issue, a considerable literature has built up trying to predict the extent to which the aviation industry would be able to pass on the costs of the EU ETS. Regularly cited studies include:

- Oxera, 2003, Assessment of the Financial Impact on Airlines of Integration into the EU Greenhouse Gas Emissions Trading Scheme (study for BAA External Emissions Trading Steering Group);
- PWC, 2005, Aviation Emissions and Policy Instruments (study for European Commission).
- CE Delft, 2006, Giving Wings to Emission Trading - Inclusion of aviation under the European Emission Trading System (ETS): Design and Impact (study for the European Commission).
- Vivid Economics, 2007, A Study to Estimate the Impacts of Emissions Trading on Profits in Aviation (study for UK DEFRA and DfT);
- International Air Transport Association, 2007, Financial Impact of Extending the EU ETS to Aviation.
- Ernst & Young, York Aviation, 2008, Inclusion of Aviation in the EU ETS: Cases for Carbon Leakage (study for Association of European Airlines).

Much of the literature is likely to be biased in assessing cost through potential

Many other studies have been conducted in private and have been used for strategic analysis and directly in lobbying. One common problem with all these studies is an inherent bias brought about by the study sponsor. The stakes are particularly high in this debate and none of the above studies is free from this influence. Another difficulty is the difference in assumptions over the design of the EU ETS made at the time of writing and the assumed price of EU ETS allowances. For example, some decisions around allocation design have now been clarified. In the rest of this section we objectively review the salient arguments put forward on both sides of the debate.

Arguments for full cost pass-through

Most of the studies cited above make the case for somewhere near full cost pass-through. The main justifications for this assumption are:

- ***Airlines price at marginal cost not average cost*.** The price of a ticket from a European airport is typically priced at the incremental cost of putting on that flight. Given that the aviation sector will most likely be short of allowances, each flight will be priced to include the cost of acquiring allowances. Where this is a genuinely new route, there will be no free allocation hence the full cost of buying allowances should be factored in. This includes both out-of-pocket costs and opportunity costs.

- ***The airline industry is highly competitive***. Most operators and analysts generally agree with this statement. Although there are routes where operators have certain advantages, for example through preferential airport slots or protected routes or airport gates, these restrictions are becoming fewer. Greater use of Open Skies agreements is increasing competition on previously protected routes and operators are able to acquire landing and take-off slots on a commercial basis.
- ***The airline industry does not make excessive profits***. This is in part a reflection of the competitive nature of the industry - as in a competitive industry excessive returns are rarely made and, if they are, they are soon competed away. The low levels of profitability in the industry since 2008 are shown in Figure 2. Other things being equal an industry with such low average levels of profitability will pass through costs to a greater extent than one in a healthier state where profits can be eaten into.

Arguments against full cost pass-through

- ***Routes covered by the EU ETS are exposed to competition from non-EU ETS regulated operators*****.** This is the most relevant argument limiting the ability of airlines to pass through EU ETS costs (out-of-pocket and opportunity costs). Flights inside Europe where the European airport is the final destination or the original point of departure, will all be covered by the EU ETS and hence there is little to no competition with air routes not covered by the scheme.

  Exposure to non-EU ETS regulated airlines arises because of the hub-spoke nature of some flight routes - ie where a flight to/from a European destination competes with another route which does not pass through a European airport. For example a flight from New York to Dubai flying direct would not be covered by the EU ETS, but one that made a connection in say, Frankfurt, would be covered.

  8% of passenger traffic arriving at EU airports from non EU origins connects to a non-EU destination

  The key question is how often does this situation arise? One data point is cited in E&Y's analysis for the Association of European Airlines in 2008. This states that according to figures from the UN World Tourism Organisation and IATA, around 8% of passenger traffic arriving at EU airports from non-EU origins is connecting to a non-EU destination. This provides a maximum risk of exposure to competition from non EU ETS regulated operators. Conversely however it also shows that some 92% of routes are not exposed to non EU ETS competition.

  Other sources of non EU ETS regulated competition are where airports outside the EU close to the border would be advantaged over an EU airport, either because of the regular flight routings or because long haul operators would choose to create a stop over to reduce the distance, and hence EU ETS costs, of flying into Europe. At the margin this could encourage traffic to airports close to the EU as hubs for long-haul travel.

  There is little evidence or analysis in the literature of how many routes would be affected by these effects. E&Y (2008) however provide case studies on the economics of rerouting. The results show that the differences in costs, even assuming full auctioning of allowances without any free allocation, are relatively small:

  – Ignoring landing charges and the extra down time of the aircraft, touching down in Dubai whilst en route from Paris to Peking would save around €2 per passenger at a carbon price of €10/tCO_2, €4 per passenger at €20/tCO_2 and €6 per passenger at €30/tCO_2. . If the effects of additional landing charges and other related costs (eg aircraft downtime) are included in the stop-over in Dubai, then the advantage is reduced even further.

  – Again, ignoring landing charges and ancillary costs, a direct flight from New York to Mumbai would be advantaged over a route that stopped over in Amsterdam by €25 per passenger. These figures reduce to €16 at €20/tCO_2 and €8 at €10/tCO_2.

  With prices for long-haul tickets of this kind at around $1000 (there is a significant range depending on specifics of the flight) these additional charges are clearly small.

- ***Operators will not be able to pass through costs at congested airports.*** Airport congestion is often used as reason of why increases in costs would not be passed through to higher ticket prices. The argument runs that where demand exceeds supply (clearly a feature of congested airports) prices will be set at the maximum consumers are willing to pay and not by competitive forces where suppliers compete for the lowest cost service. Because consumers are already paying the most they are willing to bear, in these situations it makes more sense for airlines to reduce profits rather than increase prices even further and reduce demand.

Airport congestion does not explain that costs would not be passed through

  One estimate from Oxera in 2003 is that around 25% of EU airports might be deemed congested (although the basis for this estimate is not given). The problem with this argument is that for it to hold true, the industry must be uncompetitive – either oligopolistic or monopolistic - and airlines must be making excessive profits. Whilst the former may be true at some airports, there is no evidence to show that airlines in general are making excessive profits. As noted before, most airlines in the current climate struggle to break even.

  Furthermore, if there is congestion and this is being converted into super-normal profits then it may not be to the benefit of the airlines. The scarce asset, the landing and take-off slots – are owned by the airlines but by the airport itself. Airlines will probably pay more for landing and take-off slots at congested airports.

  But again there is little evidence of airports making excessive profits. One of Europe's largest airport operators, BAA, which owns six of the main airports in the UK (including Heathrow and Stansted) made net losses after interest and exceptional items in 2008, 2009, 2010 and the first half of 2011. BAA last made a net operating profit (after interest) in 2007.

- ***Air travel markets are not competitive.*** This is the same argument as the one above where because where competition is restricted airlines will already be charging a premium for their services. But again the same counter argument holds. If the airlines are not able to pass through costs because of less than fully competitive markets, it is only because they are making excessive profits in the first place.
- ***EU ETS allowances allocations are "updated".*** This argument is still quoted by some commentators. It would be a relevant issue that may prevent some cost pass-through, but it is now out-dated. The allocation to each airline has been fixed in absolute terms up to 2020 based on the 2010 share of the cap, with the exception of New Entrant Reserve (3% of the total allocation).
- ***Passing on costs will reduce demand and therefore revenue and profits.*** This argument relates to the concept of demand elasticity – ie the percentage change in demand for a given percentage change in price.

Passing on costs through higher ticket prices will reduce demand for air travel, but the loss in earnings should never be greater than out-of-pocket costs of the EU ETS.

  Intuitively, an increase in price will reduce demand. Demand elasticities however are notoriously difficult to estimate, largely because of the challenge of isolating the effect of prices on demand when many other factors come into play. This is particularly difficult in the aviation sector where there are multiple prices on a single flight and these prices change significantly over time. In addition demand elasticities vary according to the type and location of trip, eg elasticities tend to be higher for short haul than long haul (shorter trips tend to be more discretionary over time or travellers can use substitute forms of travel such as road or rail).

A significant study on air travel demand elasticities was conducted by IATA in 2007 to contribute to the discussion on EU aviation taxes at that time.[4] This concluded that elasticities vary considerably, ranging from as low as -0.36 for a long North America-Asia flight, to as high as -1.96 for short-haul intra Europe. It is also widely recognised that leisure travel is more elastic than business travel.

A general increase in airline fares across a broad range of markets appears to be price inelastic....demand would be expected to fall by much less than the increase in fares.

They also concluded that the narrower the scope of the routes being looked at the higher the elasticity – because people can switch to alternative routes. But the more general the applicability of a price change the less elastic the response, to the extent that the reduction in traffic may be "less or much less than the proportional increase in fares". In other words "a general increase in airline fares across a broad range of markets appears to be somewhat price inelastic". This is the situation one would expect with the EU ETS where a wide range of airlines and routes would be affected.

The authors conclude that "where all airlines are faced with the same cost increase and this is passed through into air fares then, on average, demand would be expected to fall by much less than the proportional increase in fares".

The authors do not state what "price inelastic" would actually be in this situation, but a reasonable range might be from -0.6 to -0.8. Inelastic must certainly be less than unity. These figures would mean (assuming a constant price elasticity function) that net revenue would increase by 0.4% to 0.2% for a 1% increase in prices.

Revenue is vanity, profit is sanity

Any contraction is revenue is however not a measure of "cost". The correct measure of cost is lost profit. This is equivalent to the direct absorption of the costs of the EU ETS, as without cost pass-through higher costs would lead to lower profits.

The measure of cost needs to reflect the lower profit incurred from a reduction in demand and revenue.

The measure of cost therefore needs to reflect the lower profit incurred from a reduction in demand and revenue. Consider the following example: a business earns 5% profit on sales and is faced with a tax that increases prices by 10%. If the elasticity of demand is -1.0 and it passes on the full price of the tax it would see revenue fall by 10%. Profit would therefore decrease by 0.5%. This is the true cost to the business, not the foregone revenue.

These are long-run effects and in the short run the appropriate measure would be "contribution" not operating profit, and typically contribution margins are considerably greater than operating profits. Assuming a 50% contribution margin in the short term for the example above, a 10% reduction in revenue would lead to a 5% reduction in contribution.

It is worth noting that the net effect on profits of a reduction in demand from higher ticket prices on profit should never be greater than the out-of pocket costs faced by the airlines from inclusion in the EU ETS.

In our opinion the balance of all the above arguments suggests more scope for cost pass-through rather than less. The greatest deterrent to cost pass-through is the presence of international competition on routes starting and ending in non-EU locations. But whilst these routes will be affected and some leakage will probably occur, the scale of the problem is likely to be small in relation to the total coverage of the EU ETS.

Overall, in our opinion airlines will be able to recover the majority of out-of-pocket costs of acquiring EU allowances.

4.1. Can airlines recover more than out-of-pocket costs?

This issue relates to the distinction between out-of-pocket costs and "opportunity costs". Out-of-pocket costs are cash expenses to acquire allowances to cover the airlines' EU ETS covered

[4] 2007, IATA, Estimating Demand Elasticities, InterVista consulting Inc.

operations. They represent real expenditures. “Opportunity costs” reflect the foregone earnings that could have been made had the airline not made the flight and sold the allowances. They also represent a cost of providing the service as they are “consumed” when the service is provided. This applies if the allowances are provided for free or purchased.

As out-of-pocket costs represent real costs to the business airlines are likely to make significant efforts to recover them through increasing prices. Opportunity costs however are more about optimising the financial performance.

Optimising financial performance

Fixed allocations support greater recognition of opportunity costs in pricing

One of the critical design features of the EU ETS is that the allocation for each airline up to 2020 is not linked to the routes it flies in the future, only the total emissions from routes flown in 2010. This means that airlines should be highly tuned to pricing in the opportunity costs of CO2 allowances as well as the out-of-pocket costs as they will be able to realise the value from the allowances from all futures years if they choose not to fly the same route.

Because allowances are allocated to airlines at a company level and not individual routes, an airline will not distinguish between the free allocation and shortfall needed to achieve compliance on a route-by-route basis. The airline will comply at a corporate level. Each route therefore will be judged directly by its marginal profitability. And at the marginal level the full value of the CO2 allowance should be taken into consideration.

If after consideration of the opportunity costs of EU allowances the airline decides that a particular route is not profitable, it will either seek to increase prices to cover the costs, or if this is not effective, cease to operate the route and sell the allowances. Because allowances will be still be distributed to the airline at least to the end of Phase III of the EU ETS even if it does not run the route, the decision will having lasting value.

The ability to benefit from passing through opportunity costs from the EU ETS is restricted in the short term due to fixed costs

This said, the ability to switch routes in the short term will be more restricted due to the presence of fixed costs. These will include costs such as aircraft leases, landing and take-off slots, staffing contracts and various other overheads. If high a proportion of costs are fixed in the short term then the financial contribution of running the route will be high (contribution = price – variable cost). In these situations it is possible for an airline to make a positive contribution on the route but run it at a loss. In the short term therefore, airlines may be more willing to compete on price by not passing through the full opportunity cost of the allowances.

At the point where landing and take-off slots, aircraft leases or other fixed costs come up for renewal one would expect airlines to factor in the full value of EU ETS allowances in order to optimise the profitability of its routes.

The role of accounting

Experience from other EU ETS sectors such as power generation, steel and cement, shows that firms are more aware of, and have greater propensity to value, the opportunity cost of carbon allowances when their accounting systems recognise these assets on the balance sheet. This happens when “mark-to-market” or “fair value” accounting principles are used, rather than “historical” accounting principles.

Accounting conventions can have a material influence on the treatment of carbon costs in strategic and operational decisions

Under historical cost accounting, EUAs granted for free are valued in the accounts at zero value. Under fair value approaches they are valued using market prices on the basis that they are a marketable asset.

In the aviation industry, there has been a general increase in the use of fair value accounting over recent years. Although most airlines still use the historical cost convention as the basis for their accounts, fair value accounting is now commonly used for financial derivative instruments. There have also been proposals (eg by the IASB and FASB) to bring long-term aircraft leases and airline loyalty schemes onto the balance sheet as capitalised liabilities. Although not strictly a fair value issue, these proposals illustrate that accounting in the aviation sector is undergoing changes, some of which may extend in the future to greater transparency over valuing emission allowances.

4.2. Summary of pass-through factors

The issue of pass-through of carbon costs in the aviation sector is critical to understanding the financial impact on airlines of their inclusion in the EU ETS. Our analysis, which takes into some of the most widely cited studies, leads us to the following conclusions.

- In the long term, the aviation industry should be able to pass on a large proportion - although not all - of the costs of EU emission allowances in the form of higher prices. This certainly applies to the out-of-pocket costs of buying allowances but also to a substantial part of the opportunity costs.
- In the short term, we believe out-of-pocket costs from the EU ETS are still likely to be passed through for the majority of routes, but the incentives for pricing in the opportunity costs are less.

These conclusions are driven by four key points:

a) *There is no evidence that airlines make excessive profits.* This suggests that most aviation markets and strongly competitive, with ticket prices being closely linked to the cost base in the industry. In the long run if costs increase prices will need to increase for the industry to be sustainable.
b) *Flights are generally priced on their marginal value to the airline.* This means that the operators will assess the full cost and benefits of running each route, taking into account the value of all carbon allowances.
c) *The free allocation of EU ETS allowances to the airlines remains the same up to 2020 irrespective of the activity level of the airline.* This should encourage operators to value the full opportunity cost of the allowances. It is different from stationary installations in the EU ETS where if the installation shuts down it loses the right to its free allocation.
d) *Some airlines operate with high fixed costs in the short term.* This reduces the incentive for the industry to switch routes or price in the full opportunity cost of carbon allowances in the short term.

The main factor limiting full cost pass through is competition from routes not covered by the EU ETS. This is a genuine barrier to cost pass through. However it is likely to affect only around 8% of EU flights, and even for some of these flights some degree of pass through may be possible when the full costs of alternative routes are factored in, such as landing charges and aircraft utilisation.

In practice recovery of EU ETS costs will be depend on the specific characteristics of the airline, the type of passenger that they serve, the routes that they fly and the pricing models that they choose to use.

5. CONCLUSIONS

The intention in this note has been to provide an objective assessment of the net effect of the EU ETS on the aviation sector. Based on our own analysis as well as those from the literature we draw the following conclusions:

1. At current market prices the "out-of-pocket" costs faced by the aviation industry under the EU ETS are small compared to other costs the industry has to contend with. They are less than a quarter of a percent of revenue from the routes covered by the EU ETS in 2012 and around half a percent in 2020. Specifically:
   - The aviation industry will face a deficit in emission allowances of around 35% of its expected emissions throughout the course of 2012 to 2020.
   - At current EUA market prices this translates to an annual "out-of-pocket" cost of €762m in 2012 and €2,170m in 2020. These costs reduce to €629m in 2012 and €2135m in 2020 when the capacity to import CERs is taken into account.
   - These costs represent 0.24% of the revenue associated with flying the routes covered by the EU ETS in 2012 and 0.54% of revenue in 2020.
2. Two factors prevent full cost pass-through: (i) competition from non EU ETS regulated operators on some international routes, (ii) some degree of price elasticity effects. We estimate that non EU ETS regulated competition will limit full cost pass-through on around 10% of routes. In terms of elasticity effects we estimate that because of the wide geography covered by the EU ETS any reduction in demand will be less than the increase in price. Even if demand is reduced what matters is the reduction in profit. This will be a fraction of any reduction in demand.
3. In the short term it will also be more difficult for some operators to pass on costs due to a high proportion of fixed costs. Over time though, the economic value of all carbon allowances should feed through into operational and pricing decisions.
4. In the long run we expect the industry as a whole to be able to pass through just over 60% of the combined out-of-pocket and opportunity costs. This is more than the out-of-pocket costs of buying allowances. In the short run we estimate the airlines will only be able to pass through around 30% of the combined costs. This is just below the full out-of-pocket costs.
5. There will certainly also be winners and losers within the industry as the ability to pass on costs will vary by route flown and customer profile.

Table 4 and Table 5 summarise our assumptions on cost pass-through in the long and short run respectively. In the long and short run we assume that the maximum potential pass-through of out-of-pocket costs is 100% but only 66% for opportunity costs. The lower maximum pass-through for opportunity costs takes into account factors such as accounting treatment and experiences from other industries (excluding power) where opportunity costs of carbon are less readily incorporated into pricing decisions, but also that in the long run the aviation industry will seek to price these effects in as much as possible in pursuit of profit maximisation.

Table 4: Summary of industry costs in the long run

	Proportion of total costs	max pass through	Competition effects	Elasticity effects			Proportion of total costs passed through
				Elasticity	Profit margin	Cost reduction from elasticity	
Out-of-pocket costs	35%	100%	-10%	-0.7	5%	-3.5%	87%
Opportunity costs	65%	66%	-10%	-0.7	5%	-3.5%	53%
Total	**100%**						**64%**

Source: Bloomberg New Energy Finance. Assumes current market prices for CO2.

Table 5: Summary of industry costs in the short run

	Proportion of total costs	Assumed max pass through	Competition effects	Elasticity effects			Proportion of total costs passed through
				Elasticity	Contribution margin	Cost reduction from elasticity	
Out-of-pocket costs	35%	100%	-10%	-0.7	50%	-3.5%	19%
Opportunity costs	65%	66%	-10%	-0.7	50%	-3.5%	21%
Total	**100%**						**33%**

Source: Bloomberg New Energy Finance. Assumes current market prices for CO2.

ABOUT US

SUBSCRIPTION DETAILS

sales@newenergyfinance.com

CONTACT DETAILS

Guy Turner gturner10@bloomberg.net +44(0)20 3216 4086

COPYRIGHT

DISCLAIMER